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Evidence from the LFS and PIAAC

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Content

Beleidssamenvatting

Het is bekend dat in Vlaanderen de link tussen de sociale achtergrond van leerlingen en hun leerresultaten (bv. gemeten in de PISA-tests) vrij sterk is (cf. Tabel 17). Wetenschappelijk onderzoek heeft eerder al gesuggereerd dat in het bijzonder de vormgeving van het Vlaams onderwijssysteem, met zijn relatief vroege opsplitsing (*tracking*) van leerlingen in verschillende onderwijsvormen (aso/tso/bso/kso), daaraan bijdraagt (Lavrijsen & Nicaise (2013a); Lavrijsen, Nicaise & Wouters (2013); Nicaise, Spruyt, Van Houtte & Kavadias (2014)). Een kanttekening bij deze vaststelling is echter dat tests zoals PISA enkel algemene cognitieve vaardigheden meten (wiskunde, leesvaardigheid, wetenschappelijke geletterdheid), terwijl leerlingen in beroepsvoorbereidende richtingen daarnaast ook waardevolle beroepsspecifieke vaardigheden ontwikkelen. Deze laatste soort vaardigheden kunnen bij de intrede op de arbeidsmarkt heel belangrijk zijn omdat ze afgestudeerde leerlingen snel aan een job kunnen helpen. In deze paper bestuderen we, op basis van internationale gegevens uit LFS en PIAAC, in welke mate een goed ontwikkeld beroepsgericht onderwijssysteem als een 'vangnet' kan functioneren.

Onze eerste vaststelling is dat beroepsgericht onderwijs inderdaad een relatief veilige overgang naar werk garandeert (cf. Tabel 7-8, 'main effects'). Omdat sociaal zwakkere jongeren vaak in beroepsgerichte richtingen terechtkomen (cf. Tabel 15-16), kan een goed uitgebouwd beroepsonderwijs dan ook de eerder vermelde negatieve effecten van *tracking* nuanceren: de link tussen sociale afkomst en vaardigheden mag dan wel relatief sterk zijn, maar ons onderwijssysteem (en dat van andere vroeg trackende landen) slaagt er wel redelijk goed in om leerlingen voor te bereiden op een job, en dat ongeacht hun sociale afkomst (cf. Tabel 18, 25-35 cohort). Ter vergelijking kan bijvoorbeeld worden opgemerkt dat in de voornamelijk op algemeen onderwijs gerichte landen zoals de VS en Ierland de link tussen sociale afkomst en leerresultaten dan wel wat kleiner is (cf. Tabel 17), maar dat kansarme leerlingen het er vaak veel moeilijker hebben om werk te vinden (cf. Tabel 18, 25-35 cohort), net omdat er geen alternatief voor het algemeen vormend onderwijs wordt geboden wanneer ze daar uit de boot dreigen te vallen. Met andere woorden, zoals de Nederlandse socioloog Dronkers (2010) het omschreef:

> *"One of the unavoidable functions of education in contemporary society is the selection and allocation of students according to the type of education that best suits their developed abilities. Since the 1960s, most OECD countries have debated about and experimented with delaying this selection in secondary education. Because many abhor such selection functions, the delay within secondary education can be seen as an attempt to eradicate it from the educational system. Leaving this socially inevitable selection to the labour market instead of the educational system, however, creates the chance that social inequality between students from different strata will become even greater than the inequality that exists within education. After all, selection is even less universalistic (meaning the same criteria apply to everyone) on the labour market than it is in education. (…) Because the more favourable cost–benefit balance makes vocational education more attractive to students from the lower strata, well-organised vocational education can be an attractive path for upward mobility, and it can contribute to greater inter-generational mobility."*

Deze aanvankelijke voordelen van beroepsgerichte opleidingen worden echter snel kleiner met de leeftijd (cf. Tabel 7-8, 'interaction effects'). Dat de positieve arbeidsmarktvooruitzichten voor mensen met een beroepsdiploma relatief snel verslechteren met de leeftijd kan in verband gebracht worden met veranderende eisen op de arbeidsmarkt. Als gevolg van de introductie van nieuwe technologieën moeten werknemers zich steeds vaker bijscholen, en dat is eenvoudiger wanneer men kan vertrekken van een voldoende brede basisopleiding.

Uit landenvergelijkingen blijkt dan ook dat landen met een sterkere nadruk op algemene vaardigheden in de beroepsgerichte tracks er beter in slagen om mensen met een beroepsgerichte achtergrond op langere termijn aan het werk te houden. Met name in de Scandinavische landen, met hun langere gemeenschappelijke stam, hun sterkere verwevenheid tussen algemene en beroepsgerichte opleidingen, en hun sterkere gerichtheid op een universele participatie aan levenslang leren, blijft het effect van de eigen sociale afkomst op de werkzaamheid op oudere leeftijd beperkt (Tabel 18, 40-50 cohort). In onderwijssystemen met een snellere en meer uitgesproken opdeling in onderwijsvormen, zoals het Vlaamse, wordt dit effect echter weer sterker. Om opnieuw met Dronkers (2010) te spreken:

> *"The double-edged character of education creates a dilemma in the organisation of vocational education. The key for vocational education is to achieve a good balance between occupation-specific and more general training. Only when this balance has been found and maintained, well-organised vocational education can contribute to reducing the existence of unequal educational opportunities."*

Specifiek voor het Vlaamse beroepsonderwijs zijn er een aantal tekenen dat op dit moment de algemene vaardigheden van onze beroepsleerlingen nog suboptimaal ontwikkeld worden. Dit kan zowel worden afgeleid uit een internationale vergelijking van de PIAAC-testscores voor beroepsleerlingen (cf. Figuur 2) als uit de resultaten[1] van de peiling Project Algemene Vakken in het zesde jaar BSO. Hier op ingrijpen, bijvoorbeeld door het versterken van de basisvorming in het secundair onderwijs, zal zeker één van de uitdagingen worden bij het verder uitwerken van het Masterplan voor de hervorming van het secundair onderwijs.

[1] http://www.ond.vlaanderen.be/curriculum/peilingen/secundair-onderwijs/peilingen/files/Peiling-Project-Algemene-Vakken-derde-graad-bso.pdf.

Chapter 1 - Introduction

In our previous reports, we reviewed evidence suggesting that the design of the educational system influences the link between parental background and academic achievement (Lavrijsen & Nicaise (2013a)) and between parental background and the probability of high school graduation (Lavrijsen & Nicaise (2013b)). In particular, it has been demonstrated that the stratification (e.g. tracking age) and the specificity (e.g. vocational orientation) of an educational system are crucial characteristics in understanding its performance. For example, the dominant message from the literature was that early tracking reinforces the effect of social background on academic achievement (measured through international student assessments such as PISA), while it does not have a clear effect on average performance (see also Lavrijsen, Nicaise & Wouters (2013)).

However, as we already anticipated in Lavrijsen & Nicaise (2013a), such student assessments "*focus solely on the level of general skills – mathematics, reading, science. Of course, these are very important competencies, of which a decent basis is a necessity to function in modern society. However, they maybe do not tell the whole picture*". In particular, we noted that international student assessments do not take into account the more specific skills that educational systems produce as well, e.g. through vocational education. These vocational skills may be very valuable when entering the labour market. Hence, the extent to which educational systems succeed in delivering them may also be important in understanding their quality and equity.

Our present paper will focus precisely on the effect of vocational education on labour market outcomes in different countries. To what extent does vocational educational indeed succeed in offering secure pathways into employment for the academically less-inclined? Can the specific skills delivered in vocational tracks compensate for a lower proficiency in general skills? And do the advantages offered by vocational education persist over time – or do they lose relevance when the demands by the labour market change?

Chapter 2 - Labour market returns to education

2.1 Measuring returns to education

The fact that education determines labour market outcomes to a large extent has been widely documented in the literature: better educated individuals usually enjoy higher employment probabilities, a higher occupational status, and higher earnings. In general, estimates of such "returns to education" are derived from models of the form

$$Y_i = a + b*EDUC_i + c*IND_i + e_i \qquad (1)$$

in which *Y* is a labour market outcome, $EDUC_i$ a measure of educational attainment, and IND_i a selection of other relevant characteristics. Hence, the higher b, the more education is rewarded in the labour market, and the higher the returns to education. This general model then can be applied in diverse forms, depending on the variables that are chosen to operationalise *Y*, *EDUC* and *IND.*

2.1.1 Labour market outcomes

Starting with the labour market outcome *Y*, the most popular options are to estimate returns in terms of (log) earnings or in terms of employment probability. Earnings have the advantage that they capture rewards in a relatively detailed way, while a dichotomous variable such as employment probability loses a lot of information. Moreover, as the share of unemployed is often rather small (about 10%), reliable estimates can only be drawn from large enough samples.

However, there are reasons to expect that estimated returns may depend on the choice of the labour market outcome. For example, while vocational education is rather successful in establishing safe routes into employment, these jobs are often of lower status than those obtained through general education (Müller and Shavit (1998)). Hence, in this paper, we will estimate returns both in terms of employment probability and in terms of earnings.

2.1.2 Individual characteristics

Regarding the individual characteristics that have to be kept under control (*IND*), a first important choice is whether to consider the entire population or only the male part of it. The overall labour market position of females has been changing dramatically over the past decades, and the reasons behind these changes were often related to exogenous explanations which may have worked differently in different countries (e.g. differences in family structures, in childcare policies, …). This makes the patterns of female labour positions over time difficult to interpret. In this paper, we will perform some general analyses on the full sample, but we will focus our attention to the male part of the sample, in particular when estimating time patterns.

Secondly, age is an obvious determinant of labour market position. Many analyses have shown that age has a curvilinear effect: e.g. earnings are often highest in the cohort aged around 50 years (this is a cross-sectional effect: it does not mean that *individual* wages decrease as persons grow older than 50). One of the reasons behind the general increase of earnings with age is that wages are complementary with training opportunities: young people are willing to accept lower earnings in exchange for better training opportunities, but these training investments have to be rewarded towards the end of the career. Age dependency can be operationalised using any of the following variables: age, real work experience, or potential work experience (i.e. age minus years of schooling). In this paper, we will use age and its square.

2.1.3 Educational variables

The most important choice in operationalising Model (1) is to choose an adequate measure of education (*EDUC*). In probably the best known application of Model (1), Mincer (1974) estimated the returns to education in terms of the respondents' completed years of schooling (defined on the basis of the median age of those graduating with the same qualification as the respondent)[2]. Mincer then estimated that one additional year of schooling led to around 10% higher earnings each year (in the US). This "Mincer specification" has been extensively reproduced, leading to returns typically between 5 and 10% for each additional school year, dependent on the country under study (often higher in Anglo-Saxon countries; see e.g. Trostel, Walker & Woolley (2002)); for an elaborate overview, see Harmon, Oosterbeek & Walker (2003).

However, it has been argued that the number of schooling years is only an imperfect reflection of someone's "human capital", i.e. the productive skills that are rewarded on the labour market. The argument is that there can be large differences between graduates from the same educational level (e.g. secondary education) and hence with the same number of schooling years. The proposed alternative to estimating returns to years of schooling would be to estimate returns to measured skills directly. For example Hanushek and Zhang (2006) (on IALS) and Hanushek, Schwerdt, Wiederhold, and Woessmann (2013) (on PIAAC) calculated the returns to "skills" directly, which were defined as the respondents' literacy or numeracy test score. For example, in the latter paper the return to an increase by one standard-deviation in numeracy skills was estimated to be about 18%, but again with important cross-national differences).

[2] Regarding the other variables in the Model, Mincer used annual earnings in *Y*, potential experience and its square in *IND,* and restricted the sample to males.

2.2 Problems with estimating returns to education

2.2.1 Ability selectivity bias

Undoubtedly the biggest and most widely discussed problem with the above setup is the possibility of unobserved ability selectivity bias (Griliches (1977); Card (1999)). The issue is that access to educational levels and tracks is not random: different educational programmes cater for different parts of the ability distribution. For example, those who enrol in tertiary education are usually of higher ability than those that do not. Hence, do the observed differences in labour market outcomes between e.g. secondary and tertiary qualified individuals really reflect the effect of going through a tertiary programme, or do they rather reflect the differences in intake?

The ideal solution to this problem would come from including some indicator of "pre-enrolment" or "innate" ability. However, this would require longitudinal datasets combining ability scores measured at a young age with labour market outcomes observed later in life; in practice, these are only sparsely available on the national level (see Meer (2007) for an example with a UK dataset).

Hence, in this paper we will follow the approach adopted by Hanushek (2011), Hanushek and Zhang (2006) and Denny, Harmon, and O'Sullivan (2004). Here, what is controlled for is not pre-enrolment ability, but rather *currently observed* skills, such as those measured in IALS and PIAAC. It is important to note that including currently observed skills affects the estimated return to education in two ways: it removes (part of) the selectivity due to differences in intake, but it also removes (part of) the general-cognitive effect of education itself (see the previous paragraph). Indeed, the fact that the currently observed skills of tertiary graduates are higher than those of individuals with only secondary education is both due to the selectivity of tertiary programmes and to the effect of the education itself. As we can not a priori tell which of these two effects dominates, interpreting the returns to education *after* current skills control should always be done with caution. We will merely use current skill control as a way to establish lower and upper bounds of the returns to education. When we do not include current skills, our estimates of these returns are probably upward biased due to selectivity, as we explained above. By contrast, when we do include them, the bias is probably the other way round, as we control out part of the advantage attributable to participating in an educational program[3].

2.2.2 Heterogeneity of schooling

A second problem with the approaches outlined above is that both are "linear" in nature: they view education as a merely one-dimensional asset which can be "higher" or "lower". For Anglo-Saxon countries, this representation may makes some sense, as their education systems are rather

[3] Interestingly, Harmon, Oosterbeek & Walker (2000) have compared estimates of the returns to years of schooling (in the UK) controlled for "innate" ability (i.e. ability measured at age 7) and estimates controlled for "current" skills (observed in IALS). They found that controlling for ability at a young age only slightly reduced the estimated returns to education, while controlling for current skills led to much larger reductions. This suggests that the (upward) selectivity bias caused by unobserved (pre-schooling) ability is smaller than the (downward) bias when current skills are controlled out.

restrictively oriented towards increasing general skills (see Lavrijsen & Nicaise (2013a)). However, the educational systems in continental Europe are more diversified, with a large sector of vocational education offering different contents and skills than the general tracks do. In these countries, general and vocational secondary programmes deliver different types of skills, and these different skills may be differently rewarded in the labour market. In particular, the occupation-specific skills that vocational education delivers (e.g. the know-how and the practical skills necessary to become a car-mechanic) are not well represented in the two linear measures of schooling outlined above: both vocational and general secondary school graduates have about the same number of schooling years, while in the returns to 'skills' literature, these skills have been mostly restricted to general cognitive skills such as numeracy and literacy.

There may be reason to assume that this (often neglected) identification of 'education' with 'increasing general skills' may help to understand why education is often found to be differently rewarded in different nations. For example, most cross-national research (e.g. Denny, Harmon, and O'Sullivan (2004)) has found that the effect of measured skills (i.e. literacy and numeracy) on wages was higher in the US than in continental Europe. While differences in labour market regulation (e.g. centralized wage bargaining) surely can help to understand differences in monetary returns, an additional explanation may as well be that what is measured with 'general skills' covers better what education delivers in the American education system than in the vocationally-oriented systems of continental Europe. Note that Hanushek (2013) himself attributed the observed cross-national variation in returns to skills to differences in employment protection legislation (among others): a high EPL seemed to correlate with a low return to measured skills. However, as we argued in Lavrijsen & Nicaise (2013a), a high EPL also correlates with a strong vocational orientation of the education system. Hence, the explanation for the cross-national variation in the estimated return to (general) skills might just as well relate to such differences in orientation of the education system.

In this paper, we will acknowledge that schooling may be more heterogeneous than the linear proxies suggest, by explicitly taking into account the orientation of the education of the respondent (see below).

2.3 Research questions

2.3.1 Returns to vocational education

As stated above, the perspective of this paper is to focus on the heterogeneity in the return to schooling, and in particular to the way vocational education is rewarded on the labour market.

International comparative studies on the return to vocational education have been relative sparse to date due to a lack of adequate data (for studies on the national level, see e.g. Nicaise (2001) or Groenez, Heylen, and Nicaise (2010) for Belgium or Dearden, McIntosh, Myck & Vignoles (2002) for the UK). As CEDEFOP (2011) argues, most datasets containing information about labour market positions summarize the educational backgrounds of respondents in terms of the (ISCED-)level of their highest qualification, i.e. without taking into account the orientation (vocational or general) of this qualification. The major exception that CEDEFOP (2011) puts forward is the Labour Force Survey ad-hoc module 2009, which does contain information on the orientation of the qualification (but only for a subsample aged 20-35). These LFS-data were analysed in CEDEFOP (2013), in which labour market returns to secondary vocational qualifications, secondary general qualifications, tertiary technical qualifications (ISCED 5B) and tertiary academic qualifications (ISCED 5A) were estimated compared to having no secondary qualification. The main result, which we already discussed in our previous report, was that those with a secondary vocational qualification had considerably better labour market outcomes than both those with no secondary qualification and those with a secondary general qualification. However, they were less successful then those with a tertiary qualification. Moreover, the advantage seemed particularly large for those who took a workplace-based form of VET, at least at the start of the career.

In this paper, we will quantify the advantages of vocational education (both in terms of employment probability and log earnings) in two ways, first as absolute advantages and second as relative ones. The first approach is identical to that of CEDEFOP (2013): returns are determined by using the specific qualification achieved by the respondent as the measure of education, in which qualifications of the same level but with a different orientation (e.g. vocational and general secondary education) are distinguished. This means that the reference category consists of those having “no” qualification (at least none above ISCED-level 2): the “absolute” return to vocational education is the return compared to having no qualification at all. The drawback of this approach is that it generates a return to education for every single qualification separately; this makes the results less straightforwardly interpretable, and less comparable with the existing literature. Secondly, the unqualified reference category merges respondents from very different educational backgrounds. Hence, we will add another model in which we specify returns to years of schooling, but enrich it with a dummy variable indicating whether the qualification achieved was vocational in nature, and further exclude the unqualified group from this estimation (this is equivalent to Hanushek (2011)). This approach allows us to focus on the “relative” differences in the return to vocational and general programmes, controlling differences in required years of schooling.

2.3.2 The effect of general skill control

Note that CEDEFOP (2013) did not address the selectivity issue in any way; in fact, it was only argued that selectivity usually works against vocational qualifications, as their intake usually is of lower ability than that of general or tertiary programmes, and thus it can be assumed that the estimates represent only a "lower bound" of the real value of vocational programmes. However, note that this assumption is clearly violated when vocational graduates are compared with individuals without a secondary qualification; in that case, the selectivity bias probably works the other way round. Furthermore, not addressing selectivity issues may also blur cross country comparisons, as the selectivity bias may vary across countries; even when the estimates would just be lower bounds, this does not say anything about the extent to which the "real" value of vocational education approaches this lower bound across different countries.

Hence, in this paper we will determine how adding skill control affects the estimated returns to different types of education, and in particular to vocational education. Due to a lack of data yet little attention has been spent on how controlling out current skills might influence the estimated returns to different types of education. As explained above, controlling out current skills probably removes selectivity bias at the cost of removing part of the education effect itself. These two effects may occur with different strengths depending on the type of education considered. While in uncontrolled models the upward selectivity bias will be strongest for academic qualifications, in models with general skills control the downward bias may be strongest for academic qualifications as well, as such programmes usually heavily invest in developing high-level cognitive skills.

There are some indirect indications that general skill control indeed may affect estimates of returns to education differently across qualifications types; e.g. Boissiere, Knight & Sabot (1985) found that cognitive skill control reduced the estimated return to education less for manual workers than for high-skill jobs. It is also relevant to consider how differential effects of skill control depending on education type might learn us something about the mechanisms that explain why education is rewarded in the labour market. Above, we have implicitly adhered to a Human Capital perspective: education is rewarded in the labour market because it learns individuals something valuable (productive skills). However, other perspectives have claimed that education is rewarded for other reasons (Van de Werfhorst (2011)). For example, one of the major alternative perspectives has put forward that education would shape "personality" traits, such as discipline or work ethic, rather than raising directly productive skills.[4]. In fact, this claim was grounded on the observation that controlling out skills only slightly influenced (about -20%) the estimated return to education (measured in terms of schooling years; e.g. Bowles, Gintis & Osborne (2001)). However, note that this rationale again assumes that "productive skills" equals cognitive skills – hence, occupation-specific skills are neglected again. This may well be one of the reasons for the low effect of general skill control. In fact, this argument was already developed by Barone & Van de Werfhorst (2011). On IALS-data, they demonstrated that while controlling out general skills indeed reduced the return to years of schooling by only 25-35%, additionally including specific skills (e.g. the ability to interpret a technical

[4] Another alternative explanation has been that educational qualifications are just indications of "signals" of innate ability: those with highest ability enrol in the programmes at the highest level, and it is this innate ability that gets rewarded in the labour market, e.g. because more able individuals can be more easily trained by the firm (Wolf (2004)). Hence, in this perspective education would not deliver productive skills itself, but only signal someone's previous position in the innate ability distribution. However, such "signalling" theories seem to have only limited empirical validity (Van de Werfhorst (2011); Kroch & Sjoblom (1994); Carneiro, Dearden & Vignoles (2010); Borjas (2005)).

manual) reduced it with over 50%. Moreover, they observed that the effect of general skill control was smaller in vocational-oriented Germany than in the US, while the effect of the specific skill control was larger in Germany. Hence, directly examining the effect of cognitive skill control on the return to different types of qualifications can add to this observation.

2.3.3 Effects over time

As we discussed above, a typical Mincer specification is curvilinear: wages first increase with age (by cohort) and then flatten and eventually decrease. In terms of earnings, this can be explained by a trade-off between wage and training opportunities: at the start of the career, individuals are more eager to invest in training as they still can benefit from this investment for a longer period of time. Moreover, this curvilinear age pattern is expected to be steeper for the highest educated, who are usually more likely to participate in training.

Secondly, it has been observed that particularly vocational qualifications lose some of their value over time. Using IALS-data, Hanushek (2011) demonstrated that the employment probabilities of vocational graduates decreased with age, relative to those of general graduates. This has been attributed to changing labour market demands: when job requirements change, the occupation-specific skills delivered by vocational education become obsolete. Hence, occupation-specific skills may be primarily important at the start of the career, but they risk losing some of their relevance as (e.g. technological) developments alter the requirements of the occupation. This would call for a genuine investment in the general skills, also within vocational tracks, as this would enable workers to adapt to changing labour market needs (versatility), in particular through participation in life-long-learning.

Thirdly, it has been argued that returns to skills (controlled for educational attainment) increase with age. This could be explained as follows: at initial hiring, the employer is mostly unaware of the real skills of the applicant and hence has to rely on directly observable measures of school attainment. However, over time employers gain better knowledge of the real skills of individuals and hence real skills are rewarded, irrespectively of formal educational attainment (Altonji & Pierret (2001). Indeed, Hanushek and Zhang (2006) observed in the IALS that, when both qualifications and measured skills were added to the model, the effect of measured skills increased over time. Similarly, Hanushek, Schwerdt, Wiederhold, and Woessmann (2013) concluded that returns to skills (as measured in PIAAC) indeed seemed to increase with age.

Hence, our major research question is: how does the return to different types of qualifications and skills change over time?

2.3.4 Educational system design

There is a long tradition of research into cross-national differences in the design and outcomes of vocational education (Shavit & Muller (2000); Müller and Shavit (1998); Iannelli & Raffe (2007)). In short, an important distinction has been made between countries that have developed large vocational tracks, closely tied to the labour market (e.g. Germany), and countries that have not or only weakly developed such tracks within the formal educational system, at least not at the secondary level (e.g. the US). Within the "vocational-oriented" category, further distinctions have been made regarding the age at which students are directed towards this vocational track (ranging between age 10 as in Germany, and 16 as in Scandinavia) or depending on where the delivery of vocational skills takes place (in a dual arrangement with a firm as in Germany, or primarily in a school-based setting as in Flanders or the Netherlands). In Lavrijsen, Nicaise & Poesen-Vandeputte (2014) we used such characteristics to propose a typology of educational systems:

1. The dual systems (Germany, Austria) have a well-developed VET, closely tied to the labour market, which delivers occupation-specific skills mostly through workplace-training.

2. The school-based vocational systems (the Netherlands, Belgium) also have a sizeable VET sector, but apprenticeships are less common.

3. Comprehensive-vocational systems (Sweden, Finland, Norway and Denmark) share with the previous groups a highly developed VET in upper secondary, but pupils are tracked at a later age and vocational and general programmes are more interrelated.

4. The general-oriented countries (US, and to a lesser extent Ireland and the UK) have low VET enrolment rates, with VET often being organised outside the regular educational system. Ties between the educational system and the labour market are relatively weak (many students will lead to a medium-level general qualification which lacks direct relevance for the labour-market); instead, there is a strong focus on tertiary education. This leads to a polarised skill structure.

5. The Mediterranean countries (Spain, probably Italy and maybe France) show an overall low congruence between educational attainment and labour market needs and a less developed VET sector. Many students drop out of school without a secondary qualification.

Cross-national studies have indeed demonstrated that vocational-oriented systems, and in particular the dual systems, provide safe pathways into work for their vocational graduates, and hence low unemployment rates among them (Iannelli & Raffe (2007); Bol & Van de Werfhorst (2013); Shavit & Muller (2000); Allmendinger (1989); Breen (2005); Gangl (2001); Gangl (2003)). On the other hand, the jobs of vocational graduates tend to be of lower status (Shavit & Muller (2000)). CEDEFOP (2013) as well observed that vocational qualifications had the most positive effect on employment probability of young graduates in Germany and Austria.

However, note that there are a number of obstacles when comparing returns to qualifications across countries. A first major difficulty is the categorisation of national qualifications into international

comparable categories. For example, medium-level qualifications have often been divided into two categories: vocational programs preparing pupils for immediate entry in the labour market, and general programs preparing pupils for tertiary education. While this may correspond well to the qualification structure in some countries, other countries have qualifications that do not fit that well into the dichotomy (e.g. the "technical" tracks in Flanders that have mixed aims of preparing for direct labour market entry but partly for tertiary education as well). Another complication is that usually we have information on the *highest* qualification achieved only. However, countries differ in the possibilities offered to vocational secondary graduates to transfer into some form of post-secondary or tertiary education. This may also obscure the analysis of returns e.g. to vocational secondary education, as those who continued may not report vocational secondary education as their highest qualification achieved. A third, more general problem is that selectivity in the intake of different programmes differs across countries. For example, in countries with small numbers of tertiary graduates, the (innate) ability of this elite can be expected to be higher than in countries were tertiary education is more accessible. Controlling out current skills in order to avoid selectivity will not be a good solution here, as this control takes away part of the effect of education itself, while countries may differ in the degree to which education produced these skills.

The remarks made above (e.g. cross-national differences in selectivity) apply to all qualification categories. This makes the estimation of returns to qualifications compared to a specific reference group (e.g. vocational qualifications compared to the unqualified) particularly difficult, as also this reference group is differently composed across countries (and, in addition, this group is very small in some countries). Hence, we will limit our analysis of cross-country differences to a merely descriptive one. However, we will additionally consider how the educational system as a whole influences the fate of different social groups on the labour market, and in particular for students from the lower social classes. This is inspired by the repeated observation that vocational education is a gateway to a safe entry into the workforce primarily for the socially disadvantaged (Teese (2011); Shavit & Muller (2000)).[5]

Hence, given the expected value of vocational education and given the fact that the socially disadvantaged seem to make disproportionate use of this pathway, how do we expect the design of the educational system to mediate the effect of social background on labour market outcomes? Using data from several datasets (IALS, ISSP, EHCP), Brunello & Checchi (2007) showed that the social background effect was mediated by the stratification of the educational system in terms of tracking age and vocational specificity. In particular, social background was shown to influence educational attainment (years of schooling, high school graduation, enrolment in tertiary education) more strongly in early-tracking countries. However, a strong vocational specificity *decreased* the effect of social background on employment probability. Bol & Van de Werfhorst (2013) and d'Addio (2007) also found that stratified systems at the same time reduce youth unemployment and reinforce social background effects on educational attainment (years of schooling, reading proficiency). Kogan & Muller (2003) additionally showed that although stratification may succeed in securing safe pathways into the workforce, it also limits the options of the disadvantaged in accessing high-status jobs, leading to larger correlations between social background and occupational status. In the same vein,

[5] A related explanation is that the socially disadvantaged have less powerful social networks at their disposal (Pistaferri (1999), Pellizzari (2010)), while vocational education offers them other reliable pathways in the labour force; e.g. CEDEFOP (2012) showed that vocational graduates make more use of formal channels and previous experience when looking for a job than do general graduates, who have a higher inclination towards informal networks.

many studies (see Jerrim (2014) for a review) found that parental-income elasticity (the extent to which a son's earnings are unrelated to those of the father) is particularly large in the Scandinavian systems, and smaller in continental Europe but also in countries with weaker VET systems (e.g. US, UK).

In sum, the existing evidence seems to point at two different tendencies: for the socially disadvantaged, a strong vocational sector proves a major safety-net, securing pathways into safe employment, but - especially in the early-tracking countries in continental Europe - this may come at the price of blocking attractive routes into tertiary education, and subsequently, high-status and well-paid jobs. On the other hand, the absence of early vocational options, as in the general-oriented countries, keeps opportunities open for everybody as long as possible, but provides less options for those not making it (cf. Allmendinger (1989)). Note that these rationales seem to align with our description of the ideological foundations of both welfare states and educational regimes (Lavrijsen, Nicaise & Poesen-Vandeputte (2014)): in conservative welfare states (and their tracked educational systems), the primary objective is to provide employment security, even when this comes at the expense of limited mobility; in the liberal welfare states (general oriented countries), mobility is the highest objective, even if this leads to dualisation with those who do not make it having limited support or alternatives; in the social-democratic welfare states (Scandinavian countries), the universalistic principle aims to combine social mobility with security.

2.4 Summary

In this section, we will summarise the main indications from the literature review above to develop the empirical models we will construct in this paper.

As stated above, we will estimate returns to education on three labour market outcomes: employment probability, occupational status, and earnings. For all three outcomes, we will start estimating returns to education with models of the form

$$Y_i = a + b*Q_i + c*IND_i + e_i \qquad (2)$$

in which Q_i is the highest qualification achieved. Note that we will take the unqualified respondents as the reference category. However, the estimates for vocational education should not only be compared with this unqualified category, but also with the other qualifications.

Then, we will add general skills to see how this influences the estimates:

$$Y_i = a + b_q*Q_i + b_s*SKILLS_i + c*IND_i + e_i \qquad (3)$$

Remember that including current skills removes (part of) the selectivity bias but also (part of) the general cognitive effect of education itself; we expect for both reasons that vocational qualifications prove most resistant against skill control, as these cover also occupation-specific skills.

Finally, we will model interactions between age, qualification groups and skills:

$$Y_i = a + b_q*Q_i + b_{q*a}*Q_i*age + b_s*SKILLS_i + b_{s*a}*SKILLS_i*age + c*IND_i + e_i \qquad (4)$$

We expect skill levels to become more important with age, as these skills are not completely transparent to the employer in the beginning of the career. We particularly expect vocational qualifications to lose some of their value with age, as their specific skills component may become obsolete over time.

We will also consider the relative value of a vocational orientation more closely by merging several qualifications into two categories (general or vocational) which than are compared by estimating

$$Y_i = a + b_y*YOS_i + b_v*VOC_i + b_{v*a}*VOC_i*age + b_s*SKILLS_i + b_{s*a}*SKILLS_i*age + c*IND_i + e_i \qquad (5)$$

in which YOS_i is the number of completed years of schooling and VOC_i a dummy variable reflecting the vocational nature of a qualification.

Finally, we will look at some cross-country differences in the returns to education. However, note that this is a rather difficult task as countries may differ in the definitions of programmes or in the selectivity at intake. Hence, we will consider the education system as a whole and examine how labour market outcomes are distributed across different social groups.

Chapter 3 - Sample

3.1 General description of the data

As CEDEFOP (2011) concluded, it is difficult to find adequate large-scale comparative data concerning labour market outcomes of vocationally educated individuals. We will use the two datasets which have the richest content in this regard, i.e. the 2009 ad-hoc module of the Labour Force Survey (LFS) and the first wave of the Programme for the International Assessment of Adult Competencies (PIAAC). Data for LFS were collected between January and December 2009 (Austria, Belgium, Denmark: April - June 2009), while PIAAC was conducted in August 2011 - March 2012 (France: September-December 2012).

Both datasets contain information on all three variables in the models outlined above:

- *Y* - labour market outcomes, i.e.
  - whether the respondent is employed
  - earnings

- *Q* - the ISCED-level of the highest qualification of the respondent, and whether this was general or vocational in nature

- *IND* - other relevant individual characteristics, such as age, sex, country of birth, and educational level of the parents

However, there are two main differences between LFS and PIAAC. First, the LFS ad-hoc module was focussed on youngsters aged 15-35, while PIAAC contains information on 15-65 year olds. Secondly, the LFS does not contain information on the general skills level of the respondents, while PIAAC does. Hence, PIAAC is our natural first choice when we want to study the returns to education over a larger time frame and the way they are influenced by the general skill levels of graduates. However, note that for the overlapping age cohort (15-35), the LFS contains data on a much larger sample. Hence, we will use LFS here to check the validity of inferences based on the (smaller) PIAAC-sample by comparing them with estimates for the overlapping cohort on LFS.

3.2 Delimitation of the sample

In both datasets, we excluded persons aged under 20 since a large majority of these respondents is still in (compulsory) school. All respondents who are still in formal education were excluded as labour market outcomes for this group are mostly inexistent. We will exclude respondents aged over 55 for two reasons: first, to cancel out any biases due to differences in early retirement policies across countries, and second, because persons above this age (i.e. born before 1957) often have backgrounds in quite different education systems than today; for example, many European countries have deeply reformed their education systems during the '60s and early '70s.

Foreign-born respondents and respondents with foreign qualifications were excluded as well, as we are primarily interested in the effect of the education system of the current country of residence. We also excluded persons in compulsory military service.

As explained above, we will present analyses both on the full sample and on the sample restricted to males.

3.3 Countries and sample sizes

PIAAC contains information on 23 countries. We will not examine the 5 Central and Eastern European countries (Poland, Estonia, Slovakia, Czech Republic, Russia), because their educational and labour market systems have been under tremendous change in the past decades, which makes comparisons with other educational and labour markets difficult (see Lavrijsen, Nicaise & Poesen-Vandeputte (2014)). We also had to exclude 4 other countries because of data difficulties: Australia did not make its microdata publicly available, data for Canada lacked detail on the qualification level, and data for the UK and Italy did not adequately distinguish between general and vocational graduates, grouping several types of vocational graduates into a single category with graduates from general programmes. This leaves the following 14 countries to study: Austria, Belgium (Flanders), Denmark, Finland, France, Germany, the Netherlands, Sweden, Spain, Ireland, Norway, the US, Japan and Korea. For the first 10 countries in this list, we also have the corresponding LFS-data[6]. Table 1 contains the resulting sample sizes.

[6] The US, Japan and Korea do not take part in the LFS-survey, while LFS-data for Norway do not distinguish between vocational and general education. As PIAAC only contains data on the Flemish part of Belgium, we will in what follows always restrict the Belgian LFS-sample to Flanders.

Table 1: Sample sizes

	LFS (20-35)	PIAAC (20-35)	PIAAC (20-55)
10 countries			
AT	4.082	913	2.786
BE-F	1.666	953	2.835
DE	3.974	895	2.957
DK	1.786	680	2.639
ES	13.365	990	3.215
FI	3.511	944	2.720
FR	6.256	1.345	3.825
IE	9.760	1.133	3.179
NL	10.902	781	2.616
SE	6.860	728	2.107
+ 4 countries			
NO	-	-	2.462
JP	-	-	3.303
KR	-	-	4.337
US	-	-	2.508

3.4 Data definition and comparison

In this Chapter, we will define the different dependent and independent variables and consider the similarity between LFS and PIAAC in these definitions.

3.4.1 Educational background

3.4.1.1 Qualifications

Both LFS and PIAAC contain information on the level of the highest qualification of the respondent. Centrally provided classification schemes have allowed the conversion of national qualifications into international categories in an standardised way, in which both the ISCED-level and the content of the programme was taken into account (with programmes considered as "vocational" when more than 25% of their content was oriented towards a specific class of occupations or trades). This allows us to establish five broad groups of respondents:[7]

- "1-ESL": persons with no secondary qualification, i.e. no qualification higher than ISCED-level 3c-short (this corresponds to the group of "early school leavers" as defined by the European Commission);

- "2-VOC": vocational medium degrees, consisting of both
    - respondents with an ISCED 3-qualification explicitly marked as a vocational degree (note that technical tracks were usually *not* regarded as vocational)
    - respondents with an ISCED 4-qualification, regardless of whether this was explicitly marked as a vocational degree or not. The reason for this unambiguous choice is that countries were not very consistent in describing the orientation of their ISCED4-courses, often merging several types of courses in one broad unlabelled category[8]. However, most ISCED4-courses are meant either as a specialisation course for students from vocational secondary tracks or as preparation course for vocational graduates wishing to continue to a tertiary programme (see also CEDEFOP (2011), p. 24).

- "3-GEN": general medium degrees, consisting of respondents from ISCED 3-programmes that were not marked as vocational. Importantly, in many countries with three tracks the intermediate tracks were classified as general courses as well (e.g. the Flemish 'technical' TSO, the Dutch havo);

[7] In Annex 1, we explain how this classification summarises the more detailed national-specific patterns reported for the Flemish Region.

[8] For example, for PIAAC all Flemish ISCED4-courses were merged in a single unlabelled category, although we know from national data that these courses mostly consist of vocational specialisation courses (7th year or 4th grade of BSO) (see Annex).

- "4-TTE": technical tertiary degrees, i.e. respondents with a ISCED 5B (tertiary non-university) qualification;

- "5-TAC": tertiary academic degree, i.e. respondents with a ISCED 5A (university) or ISCED 6 (doctoral) degree.

In line with the literature, we will consider categories 2 and 4 as being vocational in nature, while categories 3 and 5 are considered as general qualifications (Hanushek (2011); CEDEFOP (2013)).

Figure 1 summarises the qualification structures of the 20-35 cohorts in the countries under study[9]. The qualification structures reveal the different logics behind various educational systems. For example, Austria and Germany clearly stand out because of their strong emphasis on medium-level vocational qualifications. By contrast, the US and Ireland have relatively few vocational graduates but many medium-general and tertiary qualifications. The Nordic countries (Finland, Sweden, Denmark) and France, the Netherlands, and Flanders are characterised by a rather high share of university graduates and a medium share of vocational qualifications. Finally, Spain stands out because of the high number of unqualified school-leavers (and a low number of medium-level vocational qualifications).

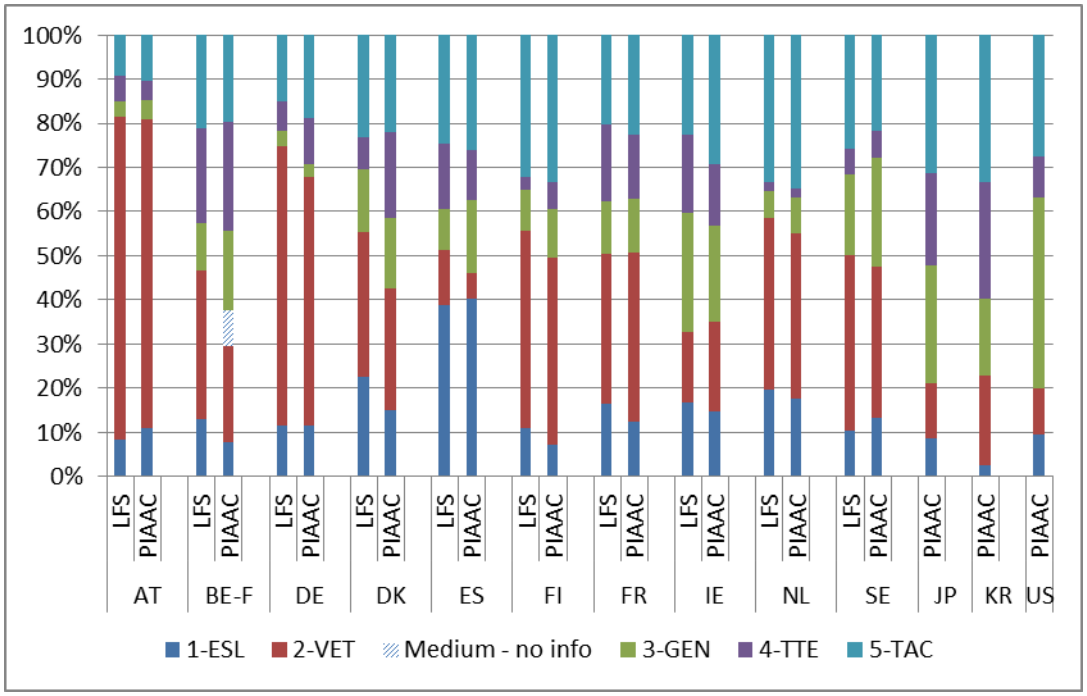

Figure 1: The distribution of the 20-35 cohort over different qualifications

For the vocational qualifications, the LFS-data further indicated whether or not the vocational training was mainly school-based (at least 75% of vocational training hours spent in school) or rather workplace-based. Table 2 conforms the dual structure (high emphasis on apprenticeships) in Austria, Germany and Denmark, while such arrangements are rather marginal in Flanders, Finland, and Spain. Unfortunately, we cannot use similar information in the PIAAC-data.

[9] Note that respondents with a qualification 'ISCED 3C-short' are usually included in the group "no secondary qualification". This level of qualification is rare (<1%) in all countries except Denmark, where more than 5% of the sample holds it; this might explain the seemingly high share of unqualified respondents in Denmark.

Table 2: Share of vocational qualifications obtained through school- versus workplace-based training

Country	School	Work	Country	School	Work
AT	34	66	**FI**	94	6
BE-F	89	11	**FR**	62	38
DE	2	98	**IE**	75	25
DK	13	87	**NL**	-	-
ES	90	10	**SE**	74	26

3.4.1.2 Selectivity

Moreover, when analysing cohort effects in the returns to education, in addition to the information on the educational background of the respondent himself, we will also include information on the background of his age cohort. This is done because the selectivity of different programmes has changed over time as a result of educational expansion, and hence the bias in the estimated returns to these programmes may have changed too. For example, consider the expansion of university education. Whereas previously less than 10% of a cohort obtained a university certificate, this share has now increased to over 30% in some countries (Figure 1). If we assume that universities cater only for the most able – and/or socially privileged – youngsters, and if the market power of educational degrees is correlated with their relative scarcity[10], the average value of the intake in terms of human, economic and social capital must be lower today and we can expect lower "returns" to tertiary education, even if the intrinsic quality of tertiary education itself has remained constant.

To accommodate for this, we construct a selectivity index SEL_{QUAL} for each country*cohort*educational level combination. This index is constructed by assuming that tertiary education (ISCED 5-6) caters for the most able and privileged individuals, followed by medium (ISCED 3-4) and then low qualifications (ISCED 0-2). Then, we will consider the share of the cohort that acquired a given qualification. For example, in a country*cohort where 10% of the respondents acquired a high qualification, we assume that these 10% came from the top end of the (pre-enrolment) 'capability' distribution[11] (i.e. between the 90^{th} and 100^{th} percentile): all respondents from this country and cohort with a tertiary qualification receive a selectivity index equal to (90+100)/2 = 95. For a younger cohort in this country, e.g. in which tertiary education expanded up to 30% of the cohort, the selectivity index drops to (70+100)/2 = 85, which indeed reflects that

[10] Access to education is socially biased, in the sense that youngsters from socially disadvantaged backgrounds are often less eager to continue to tertiary education than equally able peers from advantaged backgrounds. In this sense, the link between selectivity and average ability of participants in a given education programme is not an exclusive one. However, note that this bias has been shown to be a long-lasting tendency (Shavit & Blossfeld (1993)), and hence our assumption that the average intake ability has gone down during the recent educational expansion does not seem to be compromised. Secondly, note that highly selective educational institutions may also produce shortages in the supply of these qualifications on the labour market, which may also lead to increased returns to selective educational programs.

[11] The term 'capability' - rather than 'ability' - is used here to represent the joint effect of individual ability, socio-economic background and 'market power' of students.

tertiary education has become less selective. This approach is identical to the one adopted by Hanushek and Zhang (2006) and Hanushek (2011).

Note that the inclusion of a selectivity index may lead to underestimation of the returns to education as such, as the index captures part of main effects of continuing education (as the most valued programmes are usually also the most selective, e.g. tertiary academic education). However, in the following analysis we are interested in the age patterns rather than the level of the returns to education.

3.4.1.3 Measured skills

PIAAC contains information on the skill proficiency of the respondents in two main domains, i.e. numeracy and literacy (besides these, problem solving skills in a digital environment were tested, but only for those able to work with a computer. Figure 2 shows the distribution of skill scores (the average of numeracy and literacy in the 20-35 sample). There is a clear difference between the overall low skill level in Spain and the overall high skill level in the Scandinavian countries (Finland, Sweden) and the Dutch speaking countries (Flanders, the Netherlands). Secondly, the general proficiency of *vocational* graduates does not completely follow this picture: it is still high in Finland, the Netherlands and Sweden, but relatively low in Flanders.

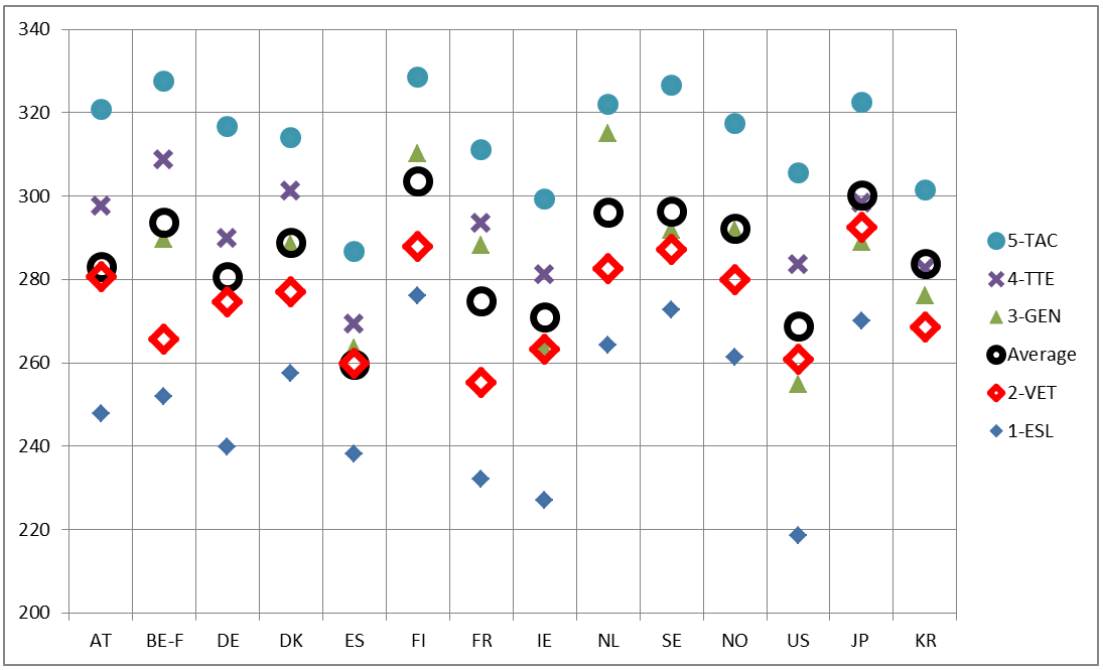

Figure 2: Average skills for different qualifications groups in different countries

As the different domains are quite strongly correlated, we will further only use the numeracy skill scores as the independent variable, as this skill type has the highest predictive power in labour market outcomes. For practical reasons, we will always use 100 numeracy points on the PIAAC-test as the unit of numeracy. This corresponds to a change of about two standard deviations in numeracy.

3.4.2 Labour market outcomes

3.4.2.1 Employment

Both LFS (variable ILOSTAT) and PIAAC (variable C_D05) contain information on the employment status of respondents in three categories (employment, unemployment, inactivity). Note that as the surveys were collected at different time frames (LFS: 2009 vs. PIAAC: 2011/2012), we may expect a shift in unemployment figures. Further remember that respondents still in education were excluded from our sample, rather than being counted as inactive as is usually done when calculating unemployment and inactivity figures.

Figure 3 compares the employment figures in the 20-35 cohort in both datasets. Obviously, a distinction can be made between the countries with high youth employment (> 85%: Austria, Flemish Region, the Netherlands) versus those with low youth employment (< 75%: Ireland, Spain).

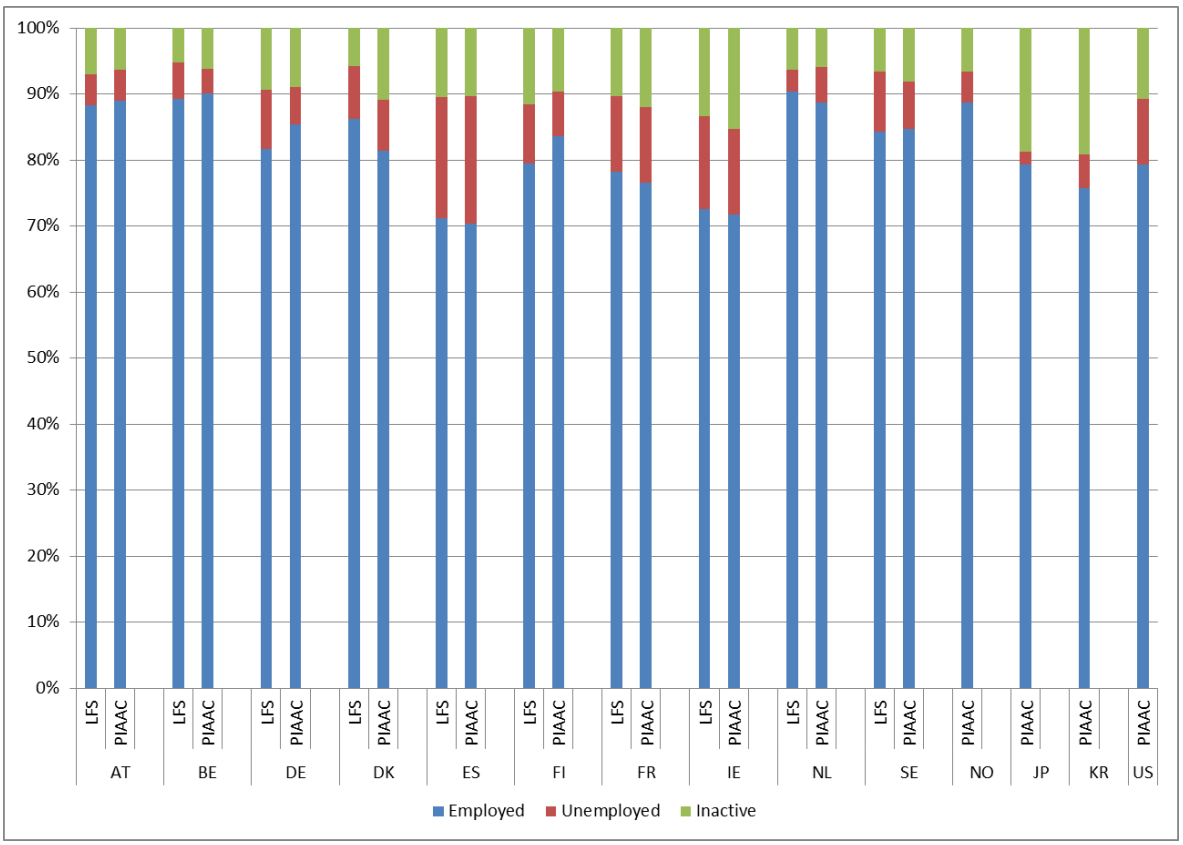

Figure 3: Unemployment and inactivity

However, note that the categories “inactive” and “unemployed” host rather small numbers of respondents in PIAAC (each between 30 and 200 respondents in every country). This makes their analysis as separate categories difficult. Moreover, it has been argued that the distinction is not always very clear; e.g. the inactivity category also contains many long-term (involuntary) unemployed

persons who have lost their entitlement to unemployment benefits. In the remainder we will merge both categories into a single "non-working" category.

3.4.2.2 Earnings

Both datasets contain information on the earnings reported by the respondent. LFS reports only the respondents' relative position (decile) in the national income distribution (variable INCDECIL), which is defined as "the monthly (take-home) pay after deduction of income tax and National Insurance Contributions. It includes regular overtime, extra compensation for shift work, seniority bonuses, regular travel allowances and per diem allowances, tips and commission, compensation for meals." This variable is only recorded for employees (thus not for the self-employed) and is missing for the Netherlands and Sweden.

In PIAAC the information on earnings is more genuine. First, all 14 countries report information on the earnings decile (variable EARNMTHALLDCL), defined as the 'Monthly earnings including bonuses for wage and salary earners and self-employed, in deciles' (note the inclusion of the self-employed). Moreover, PIAAC contains information on absolute earnings for 10 countries (missing for Austria, Germany, the US and Sweden; variable EARNMTHALL= 'Monthly earnings including bonuses for wage and salary earners and self-employed'). In line with Hanushek, Schwerdt, Wiederhold, and Woessmann (2013), we excluded the top and bottom 1% from the earnings distribution of every country, which usually include many coding errors.

In this report, we will use both types of earnings data. First, using relative figures (deciles) has the advantage that we can compare results with LFS and that we have information for all countries; using absolute income figures has the advantage that it better suits with usual return to education estimates from the literature.

3.4.2.3 Life-long learning

Both datasets contain information on participation in learning activities. As in this paper we are primarily interested in determining the influence of lifelong learning on labour market outcomes, we will only consider participation with a job-related purpose. Note that LFS only considers participation in the previous 4 weeks (COURATT: "Attended any courses, seminars, conferences or receive private lessons or instructions outside the regular education system within the last four weeks",) with an indication whether the "most recent" learning activity (only) was job-related. This leaves only very limited information on LLL-participation (see the recent publication by Steunpunt WSE for Belgium, http://www.steunpuntwse.be/system/files/arbeidsmarktflits_2014-06-23.pdf).

By contrast, PIAAC considers participation in LLL within the entire previous year, and does not limit itself to the most recent activity only. Moreover, PIAAC contains information on the number of hours that respondents participated in education, but unfortunately only for *non-formal* learning activities. Participation in job-related LLL equalled about 46% for the entire PIAAC-population, with higher values in the Scandinavian countries and lower values in Southern countries (France, Italy) and to a lesser extent Belgium (42.4%).

However, while the information from PIAAC is more extensive than that from the LFS, it still does not really allow to test whether differences in participation in LLL is indeed the main driver of the expected differences in the life cycle patterns across educational programmes (see 2.3.3). Indeed, while it seems obvious that participation in LLL raises employment probability in the long term (because of a more up-to-date skill profile), there are numerous methodological pitfalls. For example, any correlation between participation in LLL during the previous year and having a job at the moment of the interview may be biased by the fact that most LLL activities take place at the workplace (one of the questions used to determine participation in job-related LLL (B_Q013) indeed explicitly refers to participation in work-place-based LLL activities). Hence, a positive relationship between participation in LLL and employment is to be expected indeed, but the causality might go both ways.

Hence, in this document we will not consider into detail the mediating role of LLL in explaining our results. We just suggest that LLL might indeed be one of the underlying factors explaining differences in labour market success; vocational respondents indeed take less part in LLL (42% of the employed respondents) than those with a tertiary technical (55%) or academic degree (67%), though their participation rate still equals that of their general secondary peers (40%) and exceeds that of unqualified respondents (28%). Moreover, there seems to be a strong cross-country variation in participation to LLL: in the Scandinavian countries, up to 50-60% of the vocational respondents participated in at least one LLL activity during the previous year, while in Belgium (Flanders) and France this amounts to no more than 25%.

However, a further investigation of these and other patterns is referred to the next SSL-report in this research line, in which we will also make use of the recent wave of the Adult Education Survey which contains much more detailed information about LLL participation.

3.4.3 Other individual characteristics

Both the LFS and PIAAC-data contain information on the parental background of the respondents (highest educational level of mother or father). Here “low educated parents” refer to parents with qualifications at ISCED-level 0, 1, 2 or 3c short, “medium educated parents” to qualifications at ISCED-level 3-4 (without 3c short) and “high educated parents” to ISCED-levels 5 or 6. As parental background is missing in a significant number of the PIAAC-cases for France (+20% missings), we will exclude that country from our analyses on the effect of social background.

PIAAC indicates the experience with working-life of the respondent (variable C_Q09_C, “Current status/work history - Years of paid work during lifetime”). LFS does not contain this variable.

Finally, both datasets contain information on the gender of the respondents (0 = male, 1 = female) and their age (reported in 5-year bands).

Chapter 4 - Returns in terms of employment probability

4.1 The PIAAC-sample compared with LFS

We start by estimating the following multinomial model on both the LFS- and the PIAAC-sample (restricted to 20-35 year olds) to examine the validity of the latter. The model estimates the effect of having a specific qualification on the odds of being unemployed or inactive (relative to having a job), with unqualified respondents as the reference category:

$$Y_i = a + b*Q_i + c*IND_i + e_i \qquad (2)$$

IND contains age, age squared and gender; we also included country fixed effects and cluster standard errors by country. We also estimated the same model with "not having a job" as the outcome category, i.e. merging the inactive with the unemployed category. The results are presented in Table 3 (in this and all following tables in this report, we indicate statistical significance with *** ($p < 0.01$), ** ($p < 0.05$), * ($p < 0.10$)).

Table 3: Estimates of returns to education, LFS and PIAAC (males + females, 10 countries)

	Unemployment		**Inactivity**		**"Non-working"**	
	LFS	PIAAC	LFS	PIAAC	LFS	PIAAC
Intercept	-0,91	-1,27	-2,04	-1,56	-0.66	-0,68
2-VET	-0,93***	-1,02***	-1,30***	-1,41***	-1.10***	-1,21**
3-GEN	-0,73***	-0,77***	-0,84***	-1,07***	-0.78***	-0,92***
4-TTE	-1,41***	-1,54***	-1,92***	-1,91***	-1.64***	-1,72***
5-TAC	-1,40***	-1,15***	-1,81***	-2,23***	-1.59***	-1,65***
AGE	-0,10***	-0,16*	-0,07***	-0,02	-0.09***	-0,09
AGE²	0,001	0,008	0,006	-0,002	0.004***	0,003
SEX (ref: male)	-0,01	0,18*	1,29***	1,06***	0.66***	0,61***
-2 log likelihood	36623.041	32110326	36623.041	32110326	28721.873	25033207

How can the results of Table 5, and the tables to follow, be interpreted?

The regressions we have run predicted (a function of) the probability of a certain outcome (unemployment, inactivity, non-working) in terms of the individual characteristics of respondents (sex, age, and educational background). For example, the last two columns predict ln(p/(1-p)), in which p is the probability to be non-working. Hence, the table tells us that for a male LFS-respondent (sex = 0) from the [20-25] age category (age centered = 0) who does not have any qualification

$$\ln(p/(1-p)) = -0.66+(-0.09)*0+0.004*0 + 0.66*0 = - 0.66$$

and hence the non-working probability p for such a respondent is predicted to be EXP(-0.66)/(EXP(-0.66)+1) = 34%.

Similarly, for a male respondent (sex = 0) from the same [20-25] age group but with a vocational qualification

$$\ln(p/(1-p)) = -0.66+(-0.09)*0+0.004*0 + 0.66*0 \mathbf{- 1.10} = - 1.76$$

and hence p = EXP(-1.76)/(EXP(-1.76)+1) = 15%.

For a woman (sex = 1), again without a qualification and again from the [20-25] age group,

$$\ln(p/(1-p)) = -0.66+(-0.09)*0+0.004*0 \mathbf{+ 0.66*1} = 0{,}00$$

and hence p = EXP(0.00)/(EXP(0.00)+1) = 50%.

Hence, in sum, when a predictor receives a *negative* coefficient, as was the case with having a vocational qualification, the probability to be non-working is predicted to be *lower* than in the reference category (male, unqualified respondents from the age group 20-25): having a vocational qualification lowers the predicted probability to be non-working. When a predictor receives a *positive* coefficient, the probability to be non-working will be *higher* than in the reference category: females have a higher non-working probability.

The size of the coefficient also tells us "how much" the non-working probability will be lower or higher than in the reference group. However, the coefficients cannot be interpreted straightforwardly, as they express a change in the ln(p/(1-p)) which is non-linearly related to p itself. For example, in our example above a coefficient equal to -1.10 led to a shift in the predicted probabilities from 34% to 15%, which is about two times smaller. However, the size of this reduction in predicted probabilities depends on the predicted probability in the reference group. The fact that the coefficient is equal to -1.10 mathematically only means that the p/(1-p) is reduced by a factor exp(-1.10) = 0.33 (indeed, in the above example the predicted probabilities p were 34% resp. 15%, hence p/(1-p) = 0.52 resp. 0.18; the ratio between both is indeed 0.33). However, when for example the predicted probability in the reference group would have been 20% (odds = 0.25), a coefficient equal to -1.10 would still reduce the odds by a 0.33, hence the resulting odds would now equal 0.08 - which corresponds to p = 7%, or about one third of the probability in the reference group.

A first (and to our analysis essential) finding is that the estimates are **reasonably similar across LFS and PIAAC**. Only the estimates for the effect of tertiary academic qualifications seem to differ a little: while they offer a smaller protection against unemployment in PIAAC then in the LFS, the reverse is true regarding inactivity. However, these effects cancel each other out when we regard not having a job as the outcome category (i.e. merging both categories), as it shown in the last column. Hence, we are reasonably sure that the relatively small sample sizes in the PIAAC-dataset do not distort our estimates.

A second observation is that all qualifications have a significant negative coefficient: this means that they lower the probability of being unemployed resp. inactive compared to the unqualified reference category. In particular, we note that **vocational qualifications have a sizeable negative effect** on both the unemployment and the inactivity probability. Moreover, this effect is greater than that of medium-level general qualifications, but smaller than that of tertiary qualifications. This confirms the results of the previous analyses by CEDEFOP (2013).

We can also have a first look at the **effect of age** on the value of the different qualification categories. Hence, Figure 4 presents estimates for the same Model (2) run separately for the three age groups [20-25], [25-30], [30-35], on the LFS-dataset. There is a clear difference in age tendency between general and academic qualifications on one hand and vocational qualifications on the other. We will examine these tendencies more in detail when turning to the PIAAC-dataset in the next chapter.

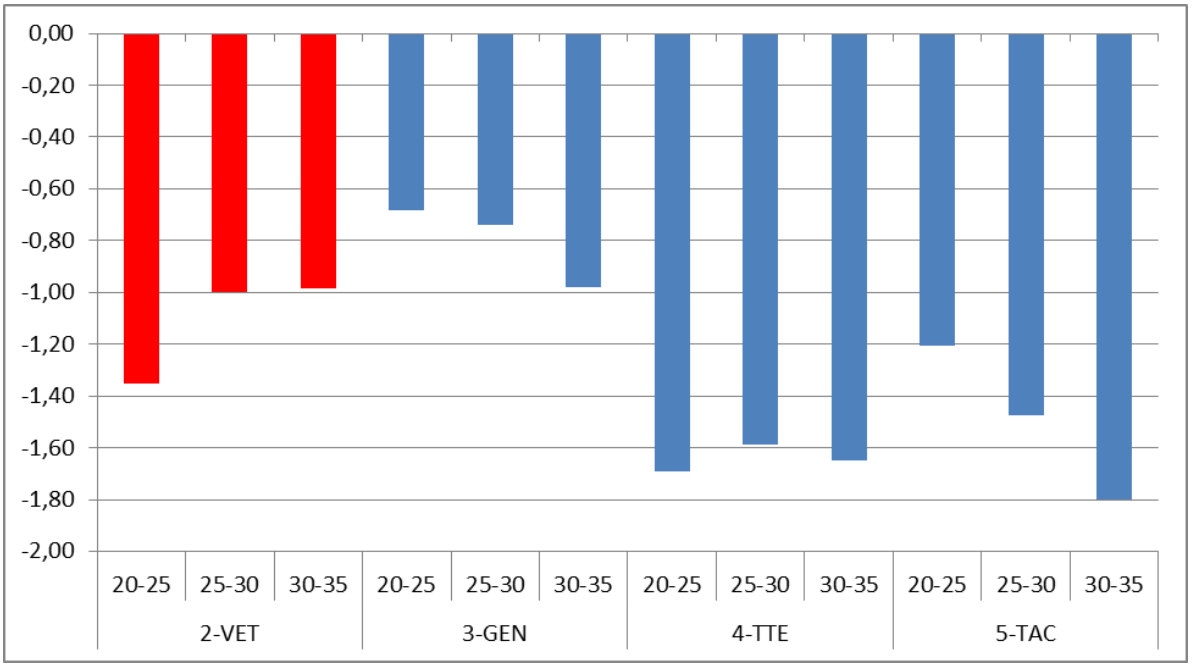

Figure 4: Effect of age on the returns to qualifications (LFS)

As we explained above, we will not be able to examine the effect of the **type of VET** in PIAAC, i.e. whether is delivered mainly in either a school-based or a workplace-based form, as PIAAC lacks the necessary information on this variable. Within the LFS-sample, however, there is a clear tendency for apprenticeships to lower the probability of not having a job. While vocational qualifications had an

overall estimate of -1,10 on the probability of not having a job, the corresponding estimate for qualifications obtained through a school-based resp. workplace-based programme are -0,88 resp. -1,27. Hence, apprenticeships seem to be the most successful type of VET in terms of the effect on finding employment, at least in the first part of the work career, as many young apprentices can start to work in the firm of their apprenticeship immediately.

4.2 Bringing skills into the picture

As we are now confident that the relatively small sample sizes in PIAAC do not distort our estimates of the effect of vocational qualifications on having a job, we can now turn to the important question about the effect of including skill measures in the model:

$$Y_i = a + b*Q_i + b'*SKILLS_i + c*IND_i + e_i \qquad (3)$$

Table 4 starts with reproducing the estimates reported in Table 3 above (and hence provisionally sticks to the same 10 countries), but now we additionally add a control for numeracy skills:

Table 4: Dependent variable non-working, PIAAC, males+females, 20-35, 10 countries

	Without skill control	With skill control	Effect of skill control (%)
Intercept	-0,68	1,28	
2-VET	-1,21**	-1,06***	-12%
3-GEN	-0,92***	-0,59***	-36%
4-TTE	-1,72***	-1,35***	-22%
5-TAC	-1,65***	-1,14***	-31%
AGE	-0,09	-0,08	
AGE²	0,003	0,002	
SEX	0,61***	0,52***	
Numerical proficiency (100 points)		-0,76***	

First, note that including proficiency scores significantly reduces the size of the estimates for all qualifications, but the return does not disappear completely. This confirms that qualifications cover a wider array of skills than only general skills. Indeed, the inclusion of a skills control does not influence the estimates for all types of qualifications to the same extent. In particular, the estimates for medium-level vocational (and to a smaller extent tertiary technical) qualifications are only slightly adjusted by the skills control (-12% resp. -22%). This confirms our suggestion that a vocational qualification covers certain occupation-specific skills other than just general skill profiency. By contrast, medium-level general qualifications lose a large part of their estimated size when skills are controlled for, as these qualifications are indeed aimed to certify a certain level of general skill proficiency.

Further note that according to the model, possessing a vocational qualification has a larger effect on employment probability than a 100 points increase in the numeracy score (i.e. about two standard deviations), all other things being equal.

These results are even clearer when we restrict the sample to males (Table 5). Apparently, including gender as a control as in Table 3 does not fully capture possible differential effects of gender on labour market outcomes across countries, age groups and/or educational categories. Hence, in the remainder of this section, we will primarily use the male-restricted sample.

Table 5: Dependent variable non-working, PIAAC, males, 20-35, 10 countries

	without skill control	with skill control	Effect of skill control (%)
Intercept	-0,63	1,75	
2-VET	-1,04***	-0,85***	-18%
3-GEN	-0,64***	-0,26**	-60%
4-TTE	-1,14***	-0,64**	-43%
5-TAC	-1,25***	-0,61*	-51%
AGE	-0,06	-0,05	
AGE²	-0,003	-0,004	
Numerical proficiency (score*100)		-0,92***	

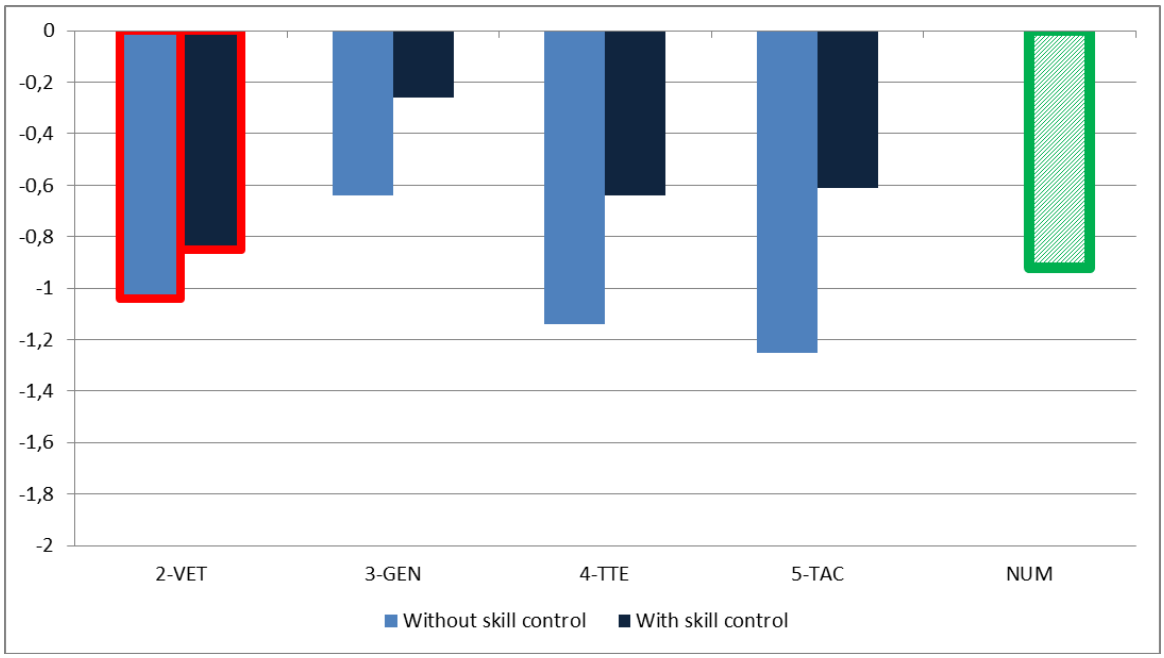

Figure 5: The effect of qualifications and skills on employment probability (PIAAC, males, 20-35, 10 countries)

4.3 A full picture

We will now expand our sample to include the full age group (20-55 year old). We will also make use of all data available, i.e. we will not restrict our sample anymore to countries listed in LFS but include data from Norway, the US, Japan and Korea as well.

Table 6 reports the results. First, vocational qualifications still have a protective effect in the full age sample, though the estimates are somewhat more modest than in the previous (younger) sample. Secondly, controlling out skills reduces the value of all qualifications, but vocational ones again seem to be most resistant. Third, the effect of skill control seems somewhat larger in the full age sample than in the youngest age group. We will examine these suggestions in more detail in the following paragraphs.

Table 6: Dependent variable non-working, PIAAC, 20-55, males, 14 countries

	Males only			Dependent: hours worked
	Without skills	With skills	%	With skills
Intercept	-0,33	2,43		29,65
2-VET	-1,17***	-0,73***	-38%	5,10***
3-GEN	-0,86***	-0,45***	-47%	3,30***
4-TTE	-1,50***	-0,76***	-49%	5,61***
5-TAC	-1,76***	-0,68***	-62%	4,30***
Age	-0,07**	-0,07***		0,7***
Age²	0,002***	0,002***		-0,01***
Sex	-	-		
Numeracy	-	-1,28***		8,65***

We added a column to table 6 representing the estimated returns with hours worked per week (volume of work) as the dependent variable instead of the odds of employment. This was done to examine whether the success of vocational education might be biased by the rise of underemployment in some countries (e.g. mini-jobs). However, the relative pattern of returns across different qualification types is reasonably similar between both dependent variables.

4.4 Interactions with age

In the models above, we always included age and its square as a control term. The resulting estimates for the linear term were negative, while these for the quadratic term were positive: this means that the probability of unemployment is a function of age in a U-shape. This is a well-documented finding in the literature: unemployment is lowest among prime-age workers, who are old enough to have left the turbulent transition period between education and work behind, but are still young enough to have an up-to-date skills profile.

However, the next question is whether the age effect is independent from qualifications and skill levels or not. Hence, we will estimate models of the form[12]

$$Y_i = a + b_q*Q_i + b_{q*a}*Q_i*age + b_s*SKILLS_i + b_{s*a}*SKILLS_i*age + c*IND_i + e_i \qquad (4)$$

On this longer time frame, we should be very cautious about changing selectivity of educational programmes over time, e.g. the expansion of tertiary education (see above). First, we accommodate for this by including the selectivity index reflecting the share of the cohort passing through a certain educational level. Secondly, we add (measured) skills to the model; as explained above, this removes both part of the selectivity bias and part of the cognitive effect of education itself.

To focus more on the relative differences between educational tracks, we additionally estimated

$$Y_i = a + b_y*YOS_i + b_v*VOC_i + b_{v*a}*VOC_i*age + b_s*SKILLS_i + b_{s*a}*SKILLS_i*age + c*IND_i + e_i \qquad (5)$$

where YOS_i is the number of completed years of schooling and VOC_i a dummy variable reflecting the vocational nature of a qualification.

The results are reported in Tables 7 and 8.

[12] Skills and age were centered to improve interpretability. We only report results for interactions between qualifications and the linear age term. It is of course also possible to include an interaction term between qualifications and squared aged (age^2) as well (which is of course still included as a main term in IND), but this would make the interpretation of the reported estimates far more complex. Moreover, the estimates for the squared term did not significant differ across qualifications. In order to facilitate the interpretations of the tables reported here, we will not report interaction terms with squared age. This is identical to the approach used by Hanushek (2011), would also report squared interactions because of non-significance.

Table 7: Dependent variable non-working, PIAAC, 20-55, males, 14 countries, with interactions

	Baseline		Selectivity index		Skills control	
Intercept	-0,95		-0,92		-1,58	
Age	-0,03	**	-0,03	*	-0,04	***
Age²	0,00	***	0,00	***	0,002	***
MAIN EFFECTS						
2-VET	-1,21	***	-1,09	*	-1,12	***
3-GEN	-0,47	**	-0,35		-0,31	
4-TTE	-1,80	***	-1,51		-1,65	
5-TAC	-0,73	**	-0,44		-0,36	
SELECTIVITY AND SKILLS						
Selectivity			-0,004		0,005	
Numeracy (*100)					-0,91	***
INTERACTIONS WITH AGE						
2-VET	+0,00		+0,00		0,01	*
3-GEN	-0,03	***	-0,03	***	-0,02	***
4-TTE	0,01		0,01		0,03	
5-TAC	-0,07	***	-0,07	***	-0,05	***
Numeracy (*100)					-0,02	***

Table 8: Dependent variable non-working, PIAAC, 20-55, males, 14 countries, with interactions

	Baseline		Selectivity		Skills control		Interaction with YoS	
Intercept	1,54		1,39		-0,54		-0,51	
Age	-0,07	***	-0,07	***	-0,08	***	-0,08	***
Age²	0,002	***	0,002	***	0,002	***	0,002	***
MAIN EFFECTS								
Years of education	-0,21	***	-0,19	***	-0,07	***	-0,07	***
Vocational orientation	-1,04	***	-1,03	***	-1,10	***	-1,10	***
SELECTIVITY								
Selectivity			-0,002		-0,000		-0,000	
Numeracy (*100)					-0,76	***	-0,75	***
INTERACTIONS WITH AGE								
Vocational orientation	0,05	***	0,05	***	0,06	***	0,06	***
Numeracy (*100)					-0,03	***	-0,03	***
Years of schooling							0,00	

First, we observe in all specification clear advantages of vocational education at the beginning of the career. In Table 7, vocational qualifications have a strong *main* effect, which means that vocational qualifications offer a strong protection against unemployment at the start for the career (remember that the centered age-variable equals zero for the age-cohort [20-25]). The effect is not only significantly negative in itself (i.e. compared to having no qualification), but the coefficients for vocational qualifications are also larger than the corresponding coefficients for secondary general and tertiary academic qualifications. In Table 8, we indeed observe that, at any given duration of schooling (which has a significantly negative coefficient itself), the strongest protection against unemployment at the start of the career is offered by qualifications with a vocational orientation. The coefficient of the variable indicating a vocational orientation is estimated to be around -1.21, which is 5 times larger than the coefficient of years of schooling.

However, the positive coefficients of the *interaction* variables in Table 7 indicate that the value of vocational and tertiary technical qualifications, compared to the unqualified reference category, decreases with age. The coefficients, however, are not significant. More importantly, in this regard, the coefficient for the interaction of age with general qualifications (at secondary as well as tertiary level) is significantly negative – hence, the value of these general qualifications increases with age. This means that the *relative* value of qualifications with a vocational orientation, as compared to the general oriented ones, decreases with age. This is also confirmed in Table 8: the interaction effect of vocational orientation with age is significantly positive. This pattern is robust against including a selectivity index and measured skills. Hence, vocational graduates may not fare worse than unqualified respondents (even though there is a small reduction in the absolute value of a vocational qualification), but the *relative* position of vocational graduates compared to graduates from general tracks deteriorates quite drastically. In fact, in Table 8 the interaction term of vocational orientation with age is estimated to be about 0.05-0.06, which is about 5% of the main term of vocational orientation (minus 1.04 – minus 1.10); hence, the protective power of a vocational orientation diminishes each year at this rate, so that after about 20 years in the labour market, vocational qualifications are no longer an advantage in terms of employment probability (given a certain number of schooling years). This is illustrated in Figure 6, which presents the non-working probability of someone with 12 years of schooling and a medium numeracy score at several stages in the career, depending on whether s/he acquired a general or a vocational degree[13].

[13] Note that this figure – which aims to illustrate the relative benefits of general vs. vocational education - presents *expected* non-working rates, *given* a certain number of schooling years and given a certain general proficiency. It does not present *observed* non-working rates.

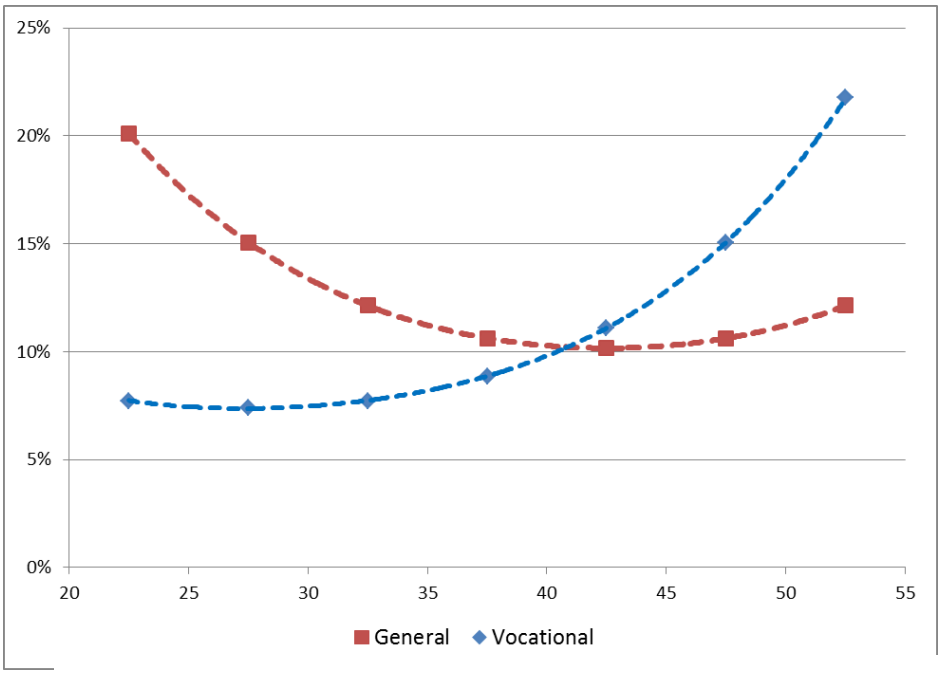

Figure 6: Non-working probability as a function of age, vocational versus general graduates (years of schooling = 12, numeracy score = 280)

We also observe in Tables 7 and 8 that having good numeracy skills is important, not only at the start of the career (controlling for years of schooling) but increasingly across one's career (significantly negative interaction terms with age)[14].

All these observations confirm the expectation that the specific skills offered by vocational education tend to depreciate over time, while the reverse is true for the general proficiency delivered by general education.

[14] Including an interaction between schooling years and age (final column) did not yield significant results.

4.5 Polarization?

Concerning the protective value of vocational education at the start of the career, we would want to add a remark relating to ongoing shifts in the labour market. According to previous research, the labour market recently has been "polarising": because of technological progress and automation, a number of jobs with a high routine content are disappearing (Autor, Levy & Murnane (2003)), in favour of jobs with either a high degree of complexity and creativity, filled by the high-educated, or simple jobs in the service sector (e.g. cleaning), taken by the low-educated. This means that jobs from the middle segment, typically occupied by employees with a vocational qualification, are falling behind (CEDEFOP (2012)).

We quantify this argument by calculating the share of jobs held by respondents from different educational backgrounds that are indeed at risk of hollowing out. For this purpose, we use the "routine intensity" indicator developed by Goos, Manning & Salomons (2011), which indicates for each occupation the balance between routine tasks on one hand and service and abstract tasks on the other. We combined this indicator with information about the occupation of respondents with different educational backgrounds, derived from LFS.

Figure 7 shows, for each qualification, the share of respondents that have a job with low, medium or high routine-intensity. The figure thus suggests that relatively many respondents with a vocational education hold jobs of medium to high routine-intensity, which, according to the polarisation theory, may be under threat of disappearing. Hence, the high protective value of vocational education at the start of the career may decrease in the future, as the occupations for which some vocational programmes prepare (e.g. machine operating) may shrink in size.

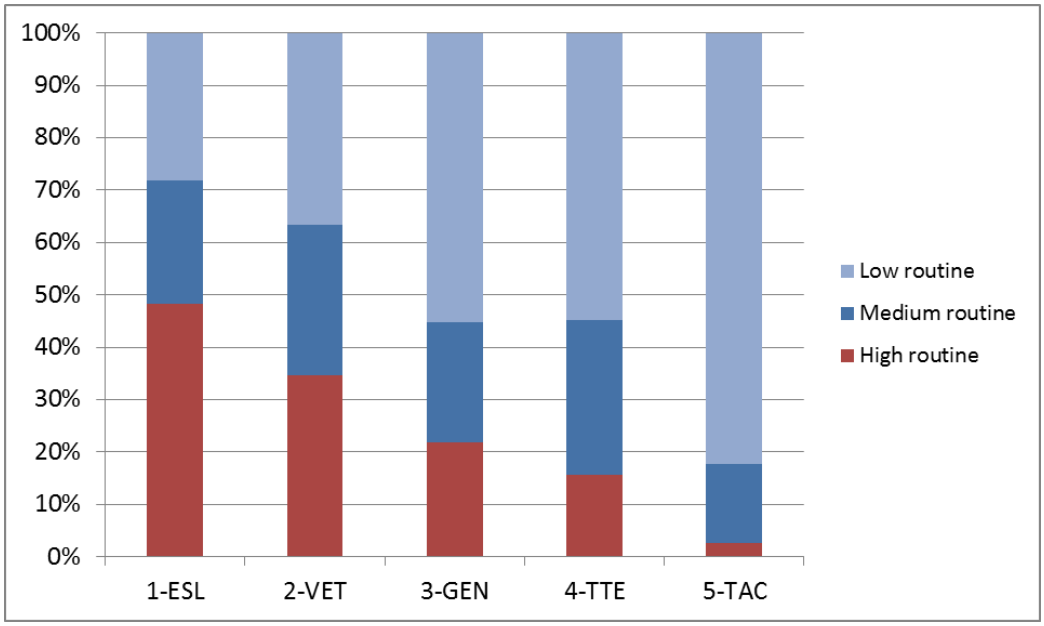

Figure 7: Non-working probability as a function of age, vocational versus general graduates (years of schooling = 12, numeracy score = 280)

Chapter 5 - Returns in terms of earnings

5.1 The PIAAC-sample compared with LFS

While in the previous chapter we considered returns in terms of employment probability, we will now examine returns in terms of earnings. We again start by estimating the following model on both the LFS- and the PIAAC-sample (restricted to 20-35 year olds) to examine the validity of the latter. The model estimates the effect of having a specific qualification on the earnings decile, with unqualified respondents as the reference category:

$$Y_i = a + b*Q_i + c*IND_i + e_i \qquad (2)$$

IND contains age, age squared and gender; we again included country fixed effects and clustered standard errors by country.

In this paragraph, we restrict our sample to the 8 countries that reported earnings deciles in both LFS and PIAAC; i.e. we provisionally exclude Sweden and the Netherlands from the PIAAC-sample. We also provisionally exclude the self-employed from PIAAC as LFS contains no data for this group. Table 9 shows the results from our ordered logit estimation;

Table 9: Estimated returns to education (earnings deciles), comparison between LFS and PIAAC (20-35, males + females, 8 countries)

	EARNINGS				WORK			
	LFS		PIAAC		LFS		PIAAC	
2-VET	0,67	***	0,78	**	1,08	***	1,21	**
3-GEN	0,75	***	0,73	***	0,75	***	0,92	***
4-TTE	1,45	***	1,24	***	1,63	***	1,72	***
5-TAC	2,42	***	2,38	***	1,55	***	1,65	***
AGE	0,13	***	0,16	***	0,09	***	0,09	
AGE^2	-0,003		-0,006	**	-0,004	***	-0,003	
SEX	1,19	***	1,23	***	0.56	***	0,61	***

The interpretation of the coefficients is relatively similar to our discussion in section 4.1, the main difference now being that the model is now estimating the probability of being in a higher earnings decile, rather than the probability of being out of work. Hence, a positive coefficient means that the predictor increases the chances of finding the respondent in a higher earnings category. It should be stressed that the coefficients resulting from an ordered logit do not bear any resemblance to the

usual interpretation of “returns to education” in terms of return rates (=percentage increase in earnings; see 5.2).

First of all, the results indicate again that the estimates are reasonably similar between both datasets; the smaller sample size in PIAAC (and the slight difference in definitions) does not seem to be a major reason for concern. Note also that age has the expected U-shape, while being a female reduces earnings all other things being equal. Secondly, all qualification types again increase the odds to find a respondent in a higher earnings category. Hence, education does not only strongly increase the probability of finding a job, as we saw in the previous chapter, but it also increases earnings, as expected. The relative differences between qualification categories are different from above, however. Tertiary academic education now has by far the greatest potential in raising someone’s income, while vocational education generates only a smaller return. Moreover, the return to medium-level qualifications is now practically independent of the orientation, i.e. the return is equal between general and vocational medium qualifications.

Note that these observations deviate from our findings for employment probability. For comparability, we added the estimates for the effect of education on employment, restricted to the same set of 8 countries, to Table 9. For employment probability, the return to vocational education was markedly higher than that of general secondary education, and the gap to the coefficients of tertiary academic education was smaller. This seems to correspond to the suggestion that vocational secondary education may be a safe pathway into employment, but it often leads to jobs that are less paid.

Table 10 shows that the results are roughly comparable when we restrict the sample to males:

Table 10: Estimates of returns to education (earnings deciles) (PIAAC, 20-35, males, 8 countries)

2-VET	0,82	***
3-GEN	0,71	***
4-TTE	1,14	***
5-TAC	2,29	***
AGE	0,21	***
AGE²	-0,008	***

5.2 Absolute earnings

In the above models, we estimated returns in terms of earnings deciles. PIAAC also contains information on the absolute earnings reported by the respondent (pre-tax). Table 11 contains the result from an OLS-estimation[15], based on the 10 countries with available earnings information in the dataset (Germany, Austria, Sweden and the US have missing information). We also replaced age with true experience, but this did not affect our results. In addition, to enable comparisons with the literature, the results from the alternative specification with years of schooling was added.

Table 11: Estimates of returns to education (earnings) (PIAAC, 20-35, males, 10 countries)

	Level and type of qualification combined with				Years of schooling			
	Age		Experience		Baseline		Orientation	
Intercept	7.18		7.70		6.49		6,53	
2-VET	0.14	***	0.14	***				
3-GEN	0.18	***	0.20	***				
4-TTE	0.26	***	0.31	***				
5-TAC	0.46	***	0.55	***				
YoS					0.06	***	0,06	***
VOC							-0.08	***
AGE	0.05	***			0.05	***	0,05	***
AGE²	-0.001	***			-0.001	***	-0,001	***
EXP			0.02	***				
EXP²			-0.001	***				

[15] As Heckman (1979) was the first to observe, one of the problems related to estimating returns to education is that we can only observe the earnings of those having a job. Those not having a job apparently do not find employment at a wage level that they deem high enough. This means that returns estimated with a Mincer specification could be downward biased, as they do not take into account that education also leads to a higher employment probability, and hence to fewer wages staying unobserved. Heckman developed a statistical technique to accommodate for this bias. However, standard statistical software packages such as SAS have problems applying this correction in models with plausible value variables (such as the numeracy scores from PIAAC) and/or clustered data. Moreover, it has also been suggested that in times of massive unemployment the bias could run the other way round (Nicaise (2001)) as labour demand scarcity leads workers to accept jobs (and the corresponding wages) below these suited for their educational level. For these reasons, we will not apply the Heckman correction in the remainder of this paper.

The first two columns indicate that a vocational qualification leads to about 14% higher earnings compared with having no qualification, which is a similar benefit as a general secondary qualification. However, the return to tertiary education is again much stronger. The last two columns suggest that every additional year of education leads to about 6% higher earnings, but when these years are spent in a vocational programme, the benefit is slightly smaller. This confirms the message from the previous paragraph.

5.3 A full picture

We will now expand our sample to include the full age group (20-55 year old). We will also make use of all available data, i.e. we will not restrict our sample anymore to countries listed in LFS but include data from Norway, the US, Japan and Korea as well. We will first again consider how including skill measures in the model influences the estimated returns to education.

Table 12: Returns to education: dependent variable earnings, PIAAC, males, 20-55, 10/14 countries

	Qualifications			Years of schooling + orientation		
RELATIVE MEASURE (14 countries)	Without skill control	With skill control	Effect of skill control (%)	Without skill control	With skill control	Effect of skill control (%)
2-VET	0.71***	0.36**	-49%			
3-GEN	0.61***	0.28***	-54%			
4-TTE	1.24***	0.63***	-49%			
5-TAC	2.25***	1.37***	-40%			
AGE	0.16***	0.16***		0.17***	0.16***	
AGE²	-0.003***	-0.003***		-0.003***	-0.003***	
Years of schooling				0.34***	0.22***	-35%
Vocational orientation				-0.13	-0.12	
Numerical proficiency (100 points)		1.31***			1.23***	
ABSOLUTE MEASURE (10 countries)						
Intercept						
2-VET	0.14***	0.08*	-42%			
3-GEN	0.18***	0.10**	-44%			
4-TTE	0.26**	0.14	-46%			
5-TAC	0.46***	0.29***	-37%			
AGE	0.05***	0.05***		0.05***	0.05***	
AGE²	-0.001***	-0.001***		-0.001***	-0.001***	
Years of schooling				0.06***	0.04***	-32%
Vocational orientation				-0.08***	-0.06***	
Numerical proficiency (100 points)		0.27***			0.26***	

First, note again that the net effect of a vocational qualification is now comparable to that of general education and significantly smaller than that of tertiary education. Secondly, including proficiency scores again significantly reduces the size of the estimates for all qualifications. However, contrary to the findings from the previous chapter, the effect of including general skills is now relatively similar across qualification categories. Moreover, the estimate of vocational education is now reduced to a larger extent than it was above. Hence, while the occupation-specific skills provided in vocational education work well as a protection against unemployment, irrespectively of the general skills of the respondent, when it comes to the level of earnings these occupation-specific skills seem to be of less importance compared to the general skills level.

The absolute return to an additional year of schooling is estimated to be around 6%, in line with previous estimates (usually between 5 and 10%). Almost a third of this return can be attributed to higher general skills. An increase of 100 numeracy points (about 2 standard deviations) leads to an increase of 26% in wage, which is in the same order of magnitude as the result reported by Hanushek, Schwerdt, Wiederhold, and Woessmann (2013).

5.4 Interactions with age

In the models above, the estimates for the linear age term were positive, while those for the quadratic term were negative: this means that earnings are function of age in an inversed U-shape. Again, our interest will rather be whether the effect of age is independent from qualifications and skill levels. Hence, we will again estimate models of the form

$$Y_i = a + b_q*Q_i + b_{q*a}*Q_i*age + b_s*SKILLS_i + b_{s*a}*SKILLS_i *age + c*IND_i + e_i \quad (4)$$

and

$$Y_i = a + b_y*YOS_i + b_v*VOC_i + b_{v*a}*VOC_i*age + b_s*SKILLS_i + b_{s*a}*SKILLS_i *age + c*IND_i + e_i \quad (5)$$

We again include a selectivity index to accommodate for changes in the selectivity of educational programmes over time (e.g. the expansion of tertiary education). Moreover, we add (measured) skills to the model, which removes part of the selectivity bias as well as part of the cognitive effect of education itself. The results are reported in Table 12 and Table 13.

Table 13: Relative earnings, PIAAC, 20-55, males, 14 countries, with interactions

	By type of qualification						By years of schooling and orientation					
	Baseline		Selectivity		Skills control		Baseline		Selectivity		Skills control	
Age	0,140	***	0,150	***	0,150	***	0,172	***	0,173	***	0,171	***
Age²	-0,003	***	-0,004	***	-0,003	***	-0,003	***	-0,003	***	-0,003	***
MAIN EFFECTS												
2-VET	0,380	*	-0,022		-0,035							
3-GEN	0,160		-0,237	*	-0,319							
4-TTE	0,607		-0,424		-0,320							
5-TAC	1,248	***	0,219		0,098							
Years of schooling							0,342	***	0,332	***	0,236	***
Vocational orientation							0,075		0,071		0,066	
SELECTIVITY												
Selectivity			0,014	*	0,006				0,001		-0,001	
Numeracy (*100)					1,005	***					0,633	***
INTERACTIONS **WITH AGE**												
2-VET	0,019	**	0,019	**	0,012							
3-GEN	0,026	**	0,026	***	0,025	***						
4-TTE	0,039	***	0,039	***	0,031	***						
5-TAC	0,062	***	0,062	***	0,050	***						
Vocational orientation							-0,013	*	-0,013	*	-0,013	*
Numeracy (*100)					0,020	***					0,036	***

Table 14: Absolute earnings, PIAAC, 20-55, males, 10 countries, with interactions

	By type of qualification						By years of schooling and orientation					
	Baseline		Selectivity		Skills control		Baseline		Selectivity		Skills control	
Intercept	7,365	***	7,365	***	7,454	***	6,460	***	6,485	***	6,734	***
Age	0,039	***	0,039	***	0,037	***	0,056	***	0,056	***	0,052	***
Age²	-0,001	***	-0,001	***	-0,001	***	-0,001	***	-0,001	***	-0,001	***
MAIN EFFECTS												
2-VET	0,035		0,036		0,020							
3-GEN	-0,056		-0,055		-0,098							
4-TTE	0,066		0,071		0,058							
5-TAC	0,202	**	0,207		0,135							
Years of schooling							0,058	***	0,055	***	0,042	***
Vocational orientation							0,020		0,019		0,045	*
SELECTIVITY												
Selectivity			0,000		-0,001				0,000		-0.000	
Numeracy (*100)					0,217	***					0,196	***
INTERACTIONS **WITH AGE**												
2-VET	0,005	*	0,005	*	0,004							
3-GEN	0,013	***	0,013	***	0,012	***						
4-TTE	0,010	***	0,010	***	0,007	***						
5-TAC	0,015	***	0,015	***	0,012	***						
Vocational orientation							-0,006	***	-0,006	***	-0,006	***
Numeracy (*100)					0,003	***					0,003	***

Starting with the main effects, we see again (in all baseline models) that, whereas all qualification types yield higher earnings at the start of the career, the effect is markedly greater for academic qualifications.

More important from our perspective, however, are the lifetime patterns we observe in the returns in terms of earnings. First, all qualified respondents see their wage increase with age (significantly) relative to those without a qualification. This is somewhat different from the pattern reported in the chapter on employment probability, in which we saw a (non-significant) decrease in the protective value of vocational qualifications, compared to those without a qualification. This may confirm the suggestion that the educated (all qualifications included) have a steeper age pattern because of the complementarity between wage and training opportunities at the start of the career. It may also reflect the marginalisation of those without any qualification in the long term.

Secondly, however, the interaction term for vocational-oriented secondary qualifications is far weaker than the corresponding term for general and academic programmes. Hence, when we compare vocational with general programs (instead of with the unqualified reference group), as in the last three models of each table, there is a significant and negative interaction effect between vocational orientation and age, independent of years of schooling. This again confirms our general message from the previous section: the specific skills produced by vocational education seem to be less resistant against obsolescence than general skills.

On the other hand, good general skills are not only rewarded at the beginning of the career, but this return further grows quite strongly with age. This suggests that after employers get to know their employees better, real skills start to determine more strongly the valuation of the worker by the employer, independent of his qualification.

Chapter 6 - Educational systems and vocational education

6.1 Country-specific returns to education

In the previous sections, we estimated returns to education on the pooled dataset, accounting for cross-national variation by including country-level fixed effects. But do the observed trends reflect the situation in every single country as well? As we noted in 2.4, comparing the returns to education across countries is difficult, e.g. because of limitations in the comparability of qualifications or because of differences in intake between educational tracks across countries. Hence, we will interpret the following results with caution.

6.1.1 Employment probability

First, we will have a look at employment probability. Note that with this dichotomous outcome variable, the size of the national samples may become an issue, in particular when we want to consider breakdowns by qualification groups, age and gender. In PIAAC, national samples (males, age 20-55) typically include around 1.500 respondents (see Chapter 3). In countries such as Spain, the US or Japan, less than 10% of these respondents have a vocational qualification. It is obvious that studying the unemployed in this subsample (typically 10 to 20% of each subsample) and trying to distinguish further between age groups involves many difficulties. Even with a larger share of vocational graduates, sample sizes may be a problem, e.g. because the unqualified group (which we took as the reference group) is even smaller in size. For these reasons, we limit the analysis of country-specific employment probabilities to a merely descriptive one, and we will focus on the European countries with a sufficient number of vocational graduates among respondents, taking both males and females into account.

The green bars in Figure 8 show the percentage of non-working respondents in the vocationally qualified group, distinctly for the youngest and the oldest cohort in the sample. The blue lines indicate the overall non-working rate in the sample, while the red bars indicate the difference between both (negative values point at a lower unemployment rate in the vocational group). The results show that at least in the youngest cohort, the dual countries confirm their exceptional performance in terms of offering safe access to jobs, with very low non-working rates among their vocationally qualified respondents (8%). In the other 6 “vocational-oriented” countries as well, young vocational respondents have relatively low non-working rates, almost everywhere lower than the overall rate (except Flanders).

However, things begin to look different again when we examine how employment probabilities change with age. Indeed, we see a clear decrease of the relative value of vocational education in all vocational-oriented countries except the Netherlands (and France and Ireland): non-working rates among the vocational qualified *relative to the overall non-working rate* increase everywhere.

However, this general tendency, which confirms the overall message from Chapter 4, masks two different national tendencies. On one hand, in the two dual countries and also in Flanders and Norway, the non-working rates in the vocational qualified group increase with age also in absolute terms. By contrast, Denmark, Finland and Sweden see their absolute non-working rates among vocational graduates *decrease* with age; the previous observations about the declining relative value of vocational education are in these countries due to the fact that the overall non-working rate decreases even more strongly. This divergence may hint at one of the other messages from Chapter 4, which suggested that a higher level of general skills could increase long-term employability under vocationally qualified respondents because of improved versatility. The Scandinavian countries indeed put a stronger emphasis on general skills in their educational system design, as seen in the longer common core and the more integrated vocational/general modules. By contrast, the dual countries have a larger specialisation, which offers benefits at the beginning of the career, but may put at risk employability in the longer turn.

Figure 8: Non-working rates among vocational graduates in 10 European countries

6.1.2 Earnings

Secondly, we estimate returns in terms of earnings. As absolute earnings data are missing for Germany, Austria and Sweden, we use relative earnings data (deciles) instead. Figure 9 shows that older respondents on average have higher earnings everywhere. We see again that vocational education graduates have relatively high earnings in the dual countries (and in Denmark and Norway), both in absolute terms and compared to their counterparts from general education. However, in contrast to our previous paragraph, the starting position of vocational respondents is lower than overall everywhere, even in the dual countries. Moreover, we see again a clear decrease of the earnings of vocational respondents *relative to the overall average*, especially in Germany and Flanders but less so in the Netherlands and Sweden.

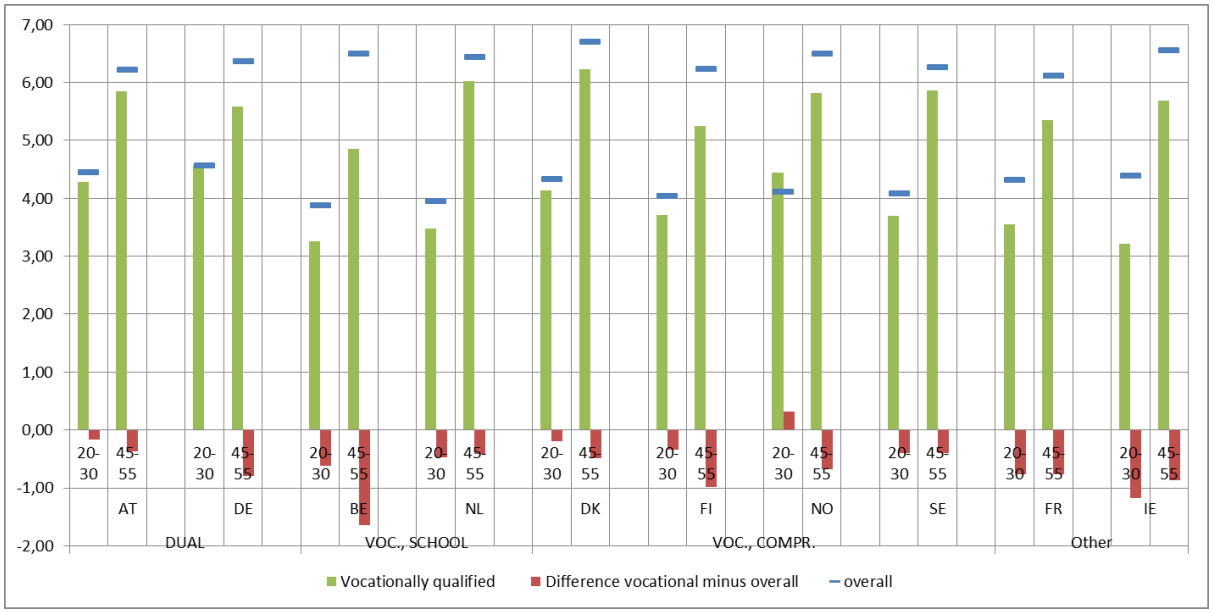

Figure 9: Earnings among vocational graduates in 10 European countries

6.2 Social background effects on labour market outcomes

Finally, we will consider how the educational system as a whole influences the position of different social groups, and how vocational education presumably mediates this influence. From the previous paragraph, we learnt that the returns to vocational education follow more or less the same basic pattern everywhere: it offers safe access into jobs (albeit often less well paid), but this relative advantage decreases with age. These tendencies are more outspoken in the dual countries than in the Scandinavian countries, which could be explained by a stronger focus on high levels of general skills in the latter. Hence, how do these tendencies shape the labour market outcomes of different social groups?

PIAAC contains only social background information in terms of the highest educational level of the parents. It is widely recognised that the educational level of parents is an important predictor of educational chances, e.g. more than occupational status or income level. Still, it is unfortunate that social background information is limited to this variable alone. Moreover, this variable only allows to distinguish between three discrete categories of respondents, i.e. with low-, medium- and high-educated parents.

Considering the issue of relatively small national sample sizes in PIAAC as well, in the following paragraphs we will add information from two other surveys in order to assess parental background effects on labour market outcomes:

- when we consider general proficiency levels, we will use additional information from PISA, which has more accurate social background information and large samples in one specific youth cohort (15 year olds);
- for labour market outcomes, we will again additionally use LFS, which for the cohort under 35 has the same social background information as PIAAC, but on much larger samples (see 3.3).

6.2.1 Educational background of disadvantaged respondents

First, we will examine where the socially disadvantaged end up in the educational system, and to what extent vocational education may be crucial in understanding their early labour market outcomes. Table 15 shows which qualifications are held by respondents who have no parent with a secondary qualification. The table shows that there is a clear distinction between:
(a) the vocational-oriented countries, where the majority of socially disadvantaged respondents acquire vocational qualifications;
(b) the 'general education' countries (Ireland and particularly the US), where they primarily enter the labour market with a general medium-level qualification;
(c) Spain, where many disadvantaged students drop out of high school.

Table 15: Share of socially disadvantaged respondents in each qualification group

	PIAAC						LFS				
	1-ESL	2-VET	3–GEN	4-TTE	5-TAC		1-ESL	2-VET	3–GEN	4-TTE	5-TAC
DE	20	66	1	11	2	**AT**	16	74	2	4	4
AT	25	64	1	3	7	**DE**	28	56	5	4	7
FI	6	57	6	6	25	**FI**	15	54	5	4	22
NL	25	44	7	3	21	**BE-F**	23	49	9	14	4
FR	19	43	14	11	13	**SE**	14	48	16	5	17
SE	20	39	14	8	18	**NL**	26	43	5	2	24
NO	25	37	9	1	28	**DK**	30	39	13	4	13
BE-F	13	34	28	18	7	**FR**	26	38	12	13	11
DK[16]	30	31	15	12	12						
IE	24	22	26	11	17	**IE**	28	17	30	14	11
US	25	7	63	2	2						
ES	52	5	16	12	15	**ES**	48	14	8	15	16

Secondly, Table 16 presents the odds ratios between respondents with low versus high-educated parents to end up in a given qualification category. For example, 25% of the socially disadvantaged students dropped out from high school in Austria (PIAAC-data, see Table 15), i.e. the odds were 1 to 3. By contrast, in the advantaged group, only 7% dropped out unqualified, i.e. the odds were approx. 1 to 13. The ratio between the odds then is approx. (1/3)/(1/13) = 4,3. Hence, when probabilities are equal, the odds ratio equals 1; a higher odds ratio indicates that the disadvantaged have higher probabilities of ending up in this qualification group, while a ratio below 1 indicates the opposite.

Table 16 thus indicates that in all countries the socially disadvantaged have higher drop-out probabilities, but that this ratio is relatively small in the Scandinavian countries (see Lavrijsen & Nicaise (2013b) for a more in-depth analysis). Secondly, the socially disadvantaged are indeed overrepresented in vocational education in all countries except in Spain and the US (were VET is marginal). Thirdly, in the US and Ireland the socially disadvantaged are overrepresented among those entering the labour market with only a medium-level general qualification. Finally, in all countries the socially disadvantaged are underrepresented in tertiary education, but again less strongly in the Scandinavian countries.

[16] Note that Danish figures on the unqualified may be overstated, as the qualification 3c-short, which is rather common in the Danish sample, are not regarded as a secondary qualification.

Table 16: Odds ratios for socially disadvantaged versus advantaged respondents to reach different qualification categories

	PIAAC						LFS				
	1-ESL	2-VET	3–GEN	4-TTE	5-TAC		1-ESL	2-VET	3–GEN	4-TTE	5-TAC
AT	4,3	1,5	0,1	0,7	0,3	**AT**	2,7	2,4	0,4	0,3	0,2
BE-F	5,7	5,1	1,6	0,5	0,1	**BE-F**	5,4	4,3	1,5	0,4	0,1
DE	3,1	2,3	0,2	1,0	0,0	**DE**	8,5	1,2	1,2	0,3	0,2
DK	4,3	2,4	0,8	0,5	0,3	**DK**	1,5	1,9	0,8	0,5	0,4
ES	8,5	0,7	1,3	1,4	0,1	**ES**	8,0	1,9	0,9	1,1	0,1
FI	1,5	3,8	0,3	1,1	0,4	**FI**	2,2	2,8	0,4	1,5	0,3
FR	8,3	5,1	1,2	0,6	0,1	**FR**	5,5	3,9	1,0	0,6	0,1
IE	7,5	1,8	2,2	0,6	0,2	**IE**	9,2	2,2	2,5	0,5	0,1
NL	2,1	2,9	0,7	1,8	0,2	**NL**	4,8	2,1	0,6	0,6	0,3
NO	2,0	1,9	0,7	0,6	0,4						
SE	3,1	1,5	0,5	1,6	0,5	**SE**	2,3	2,5	0,9	0,6	0,3
US	7,7	0,7	3,2	0,3	0,0						

6.2.2 General skills proficiency by social background

We will now consider how general skill proficiency is related to parental background. We answer this question by regressing numeracy scores on parental background and taking the coefficient of parental background as the indicator for the effect of parental background. We will compare our results in the 25-35 PIAAC-cohort[17] with the parallel figures from the PISA 2012 survey, which has much richer social background data and larger sample sizes in the specific age cohort that it covers, i.e. 15-year olds.

Table 17 shows that there indeed are some differences between specifications in the country ranking (the absolute values are of course not comparable across specifications, as both the independent and dependent variables are operationalised differently), especially when we operationalize social background in terms of the full ESCS-index in PISA, which contains more information on parental background than just the educational level (in particular, it takes also into account their occupational status and material possessions).

With the full SES-variable as the indicator of social origin in PISA, the Scandinavian countries have the smallest effects of social origin on skill levels. By contrast, the continental countries such as Flanders and Austria experience markedly larger effects of social origin on test scores.

Table 17: Effect of an increase of one unit in the social origin indicator on test scores

PIAAC 2012		PISA 2012			
Effect of parental ed. level		Effect of parental ed. level		Effect of full SES	
Sweden	9,1	Sweden	22,6	Norway	32,3
Netherlands	14,3	Netherlands	27,2	Finland	33,3
Finland	14,3	Spain	28,0	Spain	33,8
Norway	14,7	Norway	30,0	US	35,4
Spain	15,5	Finland	30,1	Sweden	35,9
Ireland	15,7	Germany	30,1	Ireland	37,9
Austria	16,6	Ireland	33,6	Denmark	39,3
Germany	17,4	US	34,2	Netherlands	39,6
Flanders	**17,9**	Denmark	34,4	Germany	42,7
Denmark	18,9	Austria	34,9	Austria	43,3
US	24,8	France	44,2	**Flanders**	**50,0**
France	25,3	**Flanders**	**56,4**	France	57,2

[17] In the former, we considered the 20-35 cohort and excluded those still studying. However, as study length is correlated to parental background, this exclusion may bias the results; hence, here we look at the 25-35 cohort.

6.2.3 Employment probability by social background

Can the disadvantages of having weaker general skills be compensated, at least to some degree, by the valuable specific skills that vocationally oriented education systems has succeeded to supply? We mimic the set-up of our previous paragraph, but now we look at the labour market position of young adults (25-35) instead of literacy performance as the dependent variable. Table 18 shows how parental background influences employment probabilities, with employment probability as the dependent variable. We use the Labour Force Survey here, because of larger sample sizes in this age cohort (we refer to PIAAC-data for Norway and the US, as LFS-data are lacking for those countries).

Table 18: Effect of a unit increase in the social origin indicator on employment odds

25-35 cohort		40-50 cohort	
DE	0,05	SE	-0,14
NO (PIAAC)	0,12	FI	-0,09
DK	0,13	AT	0,05
BE-F	**0,15**	FR	0,12
NL	0,17	DK	0,13
ES	0,22	ES	0,19
FR	0,28	NO	0,21
FI	0,28	NL	0,22
AT	0,32	DE	0,40
SE	0,37	IE	0,51
IE	0,45	**BE-F**	**0,55**
US (PIAAC)	0,72	US	0,72

The results for the 25-35 cohort show that the country ranking is quite heavily shifted compared to the ranking in terms of skills, Of all countries, continental Germany is now experiencing the smallest social origin effects on labour market entry (with Flanders and the Netherlands following this trend, but not Austria). By contrast, it is now liberal Ireland and the US that have the strongest effects of parental background on early labour market opportunities. This seems to confirm that systems with large vocational education segments can lead to rather equitable labour market positions, even if they distribute general skills inequitably. Vocational education thus indeed functions as a safe pathway for the socially disadvantaged, at least in the early stages of the career.

However, when we replicate this model on an older cohort (PIAAC[18]), the Scandinavian countries rise to the top of the ranking again, at the expense of some of the continental countries. Above, we saw that vocational education loses some its protective power with age. Hence, in those vocational countries where the socially disadvantaged are primarily found in the vocational tracks and move on less frequently into tertiary education, their disadvantage may come to the forefront again in the older age cohorts. In the Scandinavian countries however, this is mediated by a stronger emphasis on an equitable distribution of skills, as we noted above.

[18] We have to use PIAAC here because the parental background information in LFS is limited to the 15-35-cohort. Due to low sample sizes in PIAAC, we use here the information on both sexes; restricting the sampl to males does not affect the overall picture.

6.2.4 Earnings mobility

Finally, we look at the extent to which earnings are related to parental background, which could be thought of as an indicator of social mobility. In PIAAC, we see again that the Scandinavian countries have the most equitable distribution, while the extent to which Spanish or American disadvantaged individuals can move up to higher earnings deciles is much more limited (Table 19).

Table 19: Effect of a unit increase in the social origin indicator on the earnings decile (PIAAC)

SE	0,26
FI	0,27
BE-F	**0,28**
NO	0,35
IE	0,37
DK	0,41
NL	0,41
AT	0,42
DE	0,51
FR	0,51
US	0,62
ES	0,65

However, note that these figures should be interpreted with great caution: besides the relative small samples and the relatively sparse parental background information - and hence the overall limited reliability of the PIAAC-estimates, we had to rely here on *relative* earnings deciles. This may confuse the picture as part of the full earnings distribution on which these deciles are based is not represented in the subsample used here; for example, our subsample did not consider foreign-born respondents, nor the youngest (<20) and oldest (>55) cohorts (see 3.2). Hence, to the extent that these excluded respondents are not randomly distributed across deciles, this exclusion may influence the social gradient estimation; for example, when the lowest deciles in the full earnings distribution in a country would consist only of foreign-born respondents, the social gradient estimated on the restricted sample would be smaller than it would have been when these respondents would have been randomly distributed across the full earnings range. This can confound country rankings to the extent that the excluded respondents are differently distributed across the earnings range in the countries considered.

Hence, we add for this issue some information from more elaborate earnings mobility studies, in which direct measures of the income of fathers and their sons were compared to establish income elasticity (Table 20, taken from Jerrim (2014)), which probably is a more accurate way of determining

income mobility. However, despite shifts in individual positions of countries, the general picture seems to confirm our PIAAC-analysis, in the sense that the Scandinavian countries outperform both the continental and the general-oriented countries.

Table 20: Other international comparisons of intergenerational income mobility (taken from Jerrim (2014))

Jäntti et al (2006)		Blanden et al (2005)		Björklund and Jäntti (2009)		Blanden (2013)		OECD (2007)		Corak (2012)	
Country	**Beta**	**Country**	**Corr**	**Country**	**Beta**	**Country**	**Beta**	**Country**	**Beta**	**Country**	**Beta**
Denmark	0.07	Norway	0.14	Denmark	0.14	Denmark	0.14	Australia	0.17	Denmark	0.17
Norway	0.16	Canada	0.14	Sweden	0.25	Finland	0.20	Denmark	0.17	Norway	0.18
Finland	0.17	Denmark	0.14	Norway	0.26	Canada	0.23	Norway	0.18	Finland	0.19
Sweden	0.26	Sweden	0.14	Germany	0.26	Germany	0.24	Canada	0.19	Canada	0.20
UK	0.31	Finland	0.15	Australia	0.26	Sweden	0.24	Finland	0.19	Australia	0.26
US	0.52	Germany	0.17	Finland	0.28	Norway	0.25	Sweden	0.27	Sweden	0.27
		UK	0.27	Canada	0.28	Australia	0.25	Spain	0.31	New Zeal.	0.28
		US	0.29	UK	0.30	France	0.32	Germany	0.31	Germany	0.31
				France	0.45	Italy	0.33	France	0.41	Spain	0.40
				Italy	0.46	UK	0.37	US	0.47	France	0.41
				US	0.47	US	0.41	Italy	0.48	Switzerland	0.46
								UK	0.50	US	0.47
										Italy	0.48
										UK	0.49

Chapter 7 - Conclusion

In this report, we used data from LFS and PIAAC to examine how vocational education is rewarded in the labour market.

First, we observed that vocational education provides a strong advantage at labour market entry: it offers safe access to jobs (Table 7-8, main effects). The effect is not only significant compared to having no qualification, but also larger than the corresponding effect for secondary general and tertiary academic education. As many socially disadvantaged students take some form of vocational education, a strong vocational orientation may help to save disadvantaged youngsters from unemployment, as Table 18 (25-35 cohort) illustrated.

Secondly, however, this protective power of vocational education decreased with age (Tables 7-8, interaction effects; figure 6). This has been explained by ongoing changes in the demands of the labour market, e.g. following the introduction of new technologies, which make initially valuable occupation-specific skills obsolete relatively soon. A lack of adequate general skills then puts at risk the potential to update one's skills-profile through life-long-learning. Cross-country comparison indeed suggested that the Scandinavian countries, with their more equitable emphasis on strong general skills for everyone, deliver more equitable labour market opportunities in the longer term (see Table 18, 40-50-cohort)).

Thirdly, we observe more or less the same age-dependent pattern (decreasing value of VET with age, Table 13-14) when we look at earnings instead of employment probability, though the initial advantage of vocational education is already smaller in this perspective. This can be explained by the lower status of the jobs that vocational education is preparing for.

In this sense, vocational education may be interpreted as a key component of the educational and welfare state regimes we discussed in Lavrijsen, Nicaise & Poesen-Vandeputte (2014). For socially disadvantaged school leavers, a strong vocational sector provides a safety-net, securing pathways into employment, but this may come at the price of blocking attractive routes into tertiary education, and subsequently higher-status and well-paid jobs. This corresponds to what was identified (Esping-Andersen (1990)) as the prime rationale in conservative welfare states: providing security, even at the expense of limited mobility. By contrast, the absence of early vocational options, as in the US, keeps opportunities formally open for everybody, but provides less options for those not making it. This corresponds to the liberal welfare state rationale of mobility as the highest objective, even if this leads to a polarization between those who do and those who do not make it. Finally, the social-democratic welfare principle seems to reconcile social mobility with universal security by combining comprehensive educational structures with vocational tracks in upper secondary.

Hence, the main recommendation to the Flemish educational system is to further invest in the development of the general competences of vocational graduates (cf. Figure 2), by strengthening the core general skills component in vocational oriented programmes (cf. secondary education reform).

Annex 1 - Details of the qualifications reported for the Flemish Region

The classification defined in Chapter 3 summarises the often more detailed country-specific patterns into 5 groups. Table 21 shows the details of the classification for the Flemish Region, both for LFS and PIAAC (age 20-35).

First, note that for the lower (1-ESL) and the higher ends (4-TTE and 5-TAC) of the qualification distribution the share of respondents in each qualification category is reasonably similar between LFS and PIAAC. Those for medium-level qualifications show some deviations: PIAAC underestimates the share of medium-level vocational qualifications compared to the LFS, while the reserve is true for medium-level general qualifications[19].

Further, note that the LFS-data allow us to accurately split up ISCED4-courses into those with a general (7TSO, 7KSO, …) and those with a vocational orientation (7BSO, …). Apparently, just a very small fraction of the sample (0,5%) explicitly reported a general ISCED4-qualification, which validates our choice to label all ISCED4-qualifications as vocational in PIAAC, where this detailed information is lacking.

Finally, note that a significant share of the Flemish PIAAC-respondents reported a medium-level (ISCED3-degree) without specifying the track or option in which this was obtained (vocational and general). To keep in line with other countries, we will consider these respondents as general graduates as we do not have any information on their orientation.

[19] This may be due (in part) to differences between the surveys in the registration of the respondents' qualification. In PIAAC, respondents had to select their educational category directly from the list of options displayed in the second column of Table 20, while LFS-respondents were first filtered through a question about their overall ISCED-level (question 88 of the core questionnaire), after which only those with a ISCED3- or ISCED4-qualification were asked to specify the orientation of their qualification (question 103 of the ad hoc module).

Table 21: Flemish qualifications collapsed into international categories

International description	Flemish description (PIAAC)	%	Flemish description (LFS)	%
No formal qualification or below ISCED 1	Geen onderwijs of het lager onderwijs niet beëindigd	0,1	Geen diploma	1,0
ISCED 1	Lager onderwijs of basiseducatie	1,1	Lager onderwijs	1,3
ISCED 2	Lager secundair onderwijs (of eerste graad)	6,6	Lager secundair onderwijs (1ste graad of 2de graad ASO, TSO, BSO, KSO)	10,5
TOTAL 1-ESL		7,8		12,9
ISCED 3C 2 years or more	Volledig beroepssecundair onderwijs	16,6	Hoger beroepssecundair onderwijs (3ste graad BSO, leertijd, DBSO)	29,7
ISCED 4A-B	Voortgezet secundair onderwijs dat toegang geeft tot hoger onderwijs (vierde graad of derde jaar van de derde graad van het secundair onderwijs)	5,1	Postsecundair niet-hoger onderwijs (zevende jaar en vierde graad BSO), ondernemersopleiding Syntra	3,6
			Postsecundair niet-hoger niet-beroepssecundair onderwijs (zevende jaren ASO / TSO / KSO)	0,5
TOTAL 2-VET		21,7		33,8
ISCED 3A-B	Volledig algemeen, technisch of kunst-secundair onderwijs	17,9	Hoger secundair onderwijs (3ste graad ASO, TSO, KSO)	10,6
ISCED 3 (without distinction A-B-C, 2y+)	*Hoger secundair onderwijs (geen onderwijsvorm)*	*8,2*		-
TOTAL 3-GEN		26,1		10,6
ISCED 5B	Hoger onderwijs van één cyclus (korte type / professionele bacheloropleiding)	24,5	Professionele bachelor	21,7
TOTAL 4-TTE		24,5		21,7
ISCED 5A, bachelor degree	Academische bacheloropleiding (universitaire kandidatuuropleiding)	2,1		-
ISCED 5A, master degree	Universitair onderwijs of hoger onderwijs van twee cycli (lange type / masteropleiding)	17,3	Hoger niet-universitair onderwijs van 2 cycli (minimum 4 jaar), Master aan een universiteit	20,7
ISCED 6	Doctoraat	0,5	Doctoraat met proefschrift	0,4
TOTAL 5-TAC		19,8		21,1

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